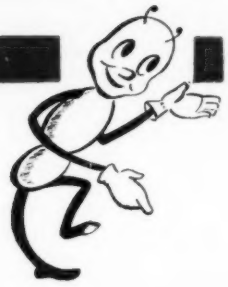
Pests
AND THEIR CONTROL
1944
MARCH
VOL. 12 NO. 3
ORGAN OF THE PEST CONTROL INDUSTRY
Entomologists
Fumigators
Termite Control Operators
Entomological Inspecticide and Supply Mfgrs.



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Pests

and Their CONTROL

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EDITORIAL

The North Central States Entomologists' Conference will be held at the University of Illinois, March 30-31. PCOs are cordially invited.

William O. Buettner Accepts W.P.B. Appointment

IN KEEPING with his policy of forwarding the related needs of the Pest Control Industry and the war effort, William O. Buettner has accepted an invitation from the Office of Civilian Requirements of the War Production Board to serve as **Business Consultant (Pest Control)**, though not on a full-time basis. Other indispensable interests having first claim on his time, an arrangement has been worked out whereby (as of February 4) Mr. Buettner will spend one day and at times two days weekly in Washington, D. C.

Generally conceded to be one of the best informed men in the Industry and an executive who knows not only how to get things started but to keep them moving as well, it is obvious Mr. Buettner comes exceedingly well equipped to this essential war post.

That he will serve with distinction to himself, the Industry and the W.P.B. we are sure. Our congratulations to the Industry and to Mr. Buettner for this well-merited recognition.

PCO's Son Honored for Bravery in Solomons

PRIVATE FIRST CLASS William Grant, Jr., whose Dad has been with the Protex Service, Chicago, for over ten years, was awarded a silver star for gallantry in action while engaged in operations against the enemy in the South Pacific Area, according to a letter from Lieutenant General M. F. Harmon, U. S. A. Forces in the South Pacific Area, addressed to William Grant, Sr., under date of January 7.

The War Department citation briefly describing his son's accomplishment is published in General Orders No. 488, dated December 14, 1943, copy of which follows:

"William Grant, Jr., (16100646), Private First Class, Medical Department, United States Army, for gallantry in action at New Georgia, Solomon Islands, in courageously going forward into the face of enemy machine-gun fire to administer first aid and safely evacuate a wounded comrade on 10 August 1943. Home Address: Chicago, Ill. . . . By Command of Lieutenant General Harmon: A. J. Barnett, Brigadier General, GSC, Chief of Staff."

Southern War Conference On Entomology

CONTROL of pests affecting health and comfort of man and domestic animals and control of pests effecting important war crops were the principal topics discussed at the 18th Annual Meeting of the Cotton States Branch, American Association of Economic Entomologists, held at the Roosevelt Hotel, New Orleans, La., February 1, 2 and 3, 1944. From 80 to 100 were present. Speaking on the "Problems of the Commercial Pest Control Operator" was Ernest R. Barber, Barber Laboratories, Inc., New Orleans.

Officers elected were: Dr. E. W. Leake of the Dallas, Texas, Federal Bureau of Entomology and Plant Quarantine, president; Charles H. Alden, Atlanta State Entomologist of Georgia, vice-president; Dr. John T. Creighton of Gainescville, Fla., head of the University of Florida's Department of Entomology, secretary-treasurer.

Of Rats and Rentals

A DEMAND FOR fewer rats or lower rent was forwarded to the Office of Price Administration by Edward Gonzalez, of 55 East 102d Street, N. Y., father of seven children, states a recent news item. Rent Director Louis H. Pink advised that if the rats infested the neighborhood, they were the city's problem; if confined to the apartment house, they were the landlord's. In the latter case, "there may be a lessening of rental value and we should look into it," said Mr. Pink.

Pacific Coast PCOs Meet in War Emergency Conference

THE PACIFIC COAST Pest Control War Emergency Conference, sponsored by the Pest Control Operators of California, Inc., was held January 30 and 31, and February 1 and 2, at the Clark Hotel, Los Angeles, Calif. Unfortunately, the detailed report of this outstanding meeting, the largest of its kind ever held in California, arrived as we were about to go to press. It was necessary, therefore, to defer its publication till the next issue, except to list the newly elected officers for the coming year, which follow: Arthur Eddy, Oakland, president; Mrs. Clara Smith, Pasadena, first vice-president; George Aitkenhead, San Francisco, second vice-president; Ray V. Haneberg, Oakland, secretary; Hugh Smith, Los Angeles, treasurer. Directors elected from the various district associations to act as state directors were: R. B. Loibl, Los Angeles; William Hogan, Pasadena; J. M. Miller, Hollywood; A. A. Beliveau, Alhambra; Wilford Gunn, Los Angeles.

Notice

We are sorry that the story and report of the Second Annual Meeting of the Canadian Pest Control Operators Association held February 21-22-23, 1944 could not appear in this issue.

The story and report, as well as a picture of the group who attended the meeting, will appear in the April issue.

Methyl Bromide Under Allocation

The War Production Board has announced that it had placed methyl bromide under allocation, effective March 1, by amending miscellaneous chemicals order M-340 to include it. The maximum monthly small order exemption is fixed at 10 pounds. No other deliveries may be made without specific authorization.

Correction

The pictures that appeared in the February issue on pages 6 and 25, stating: "Snapshots taken from Purdue Conference" should have been "Snapshots taken from Eastern Pest Control Conference."

One member wrote that he didn't think that the Massachusetts State College would object of loaning a few pictures to play-up the Purdue Conference since it was a large Institution and could very easily afford giving some credit away. He further states that to appease the boys that we give them a 10 years' subscription and some white wall tires since this might help matters considerably. We think that this is an excellent idea providing we could obtain the white wall tires.

However, we are sorry for this error.

NOTICE

Through an error at the St. Louis Meeting when the attendance roster was printed, our good member Charles Houghton of Boston, Mass. has had some difficult time in receiving his mail. Please note that the correct address is:

Charles Houghton,
Safety Fumigant Company,
31 India Street,
Boston, Mass.

The incorrect address that has been causing the trouble is the mail marked 31 Indiana instead of 31 India Street.

PCO QUIZ I

AT THE EIGHTH ANNUAL PCO Conference held at Purdue University, 200 questions (True and False, Multiple Choice and Completion Test Questions) were handed out. Unfortunately it was not possible to discuss these questions adequately until the last half day session. By that time many had left the Conference. Therefore, we are presenting a few of the questions in this issue of Pests and will continue the questions in subsequent issues. The answers will be found on another page.

It is suggested you try to answer these questions before turning to the page revealing the answers. Perhaps you might score yourselves as follows: 4 points off for each incorrect answer, or 4 points for each correct answer. You should consider yourself above average if you score 20 correct, or average if you score 16 correct.

Check whether the following statements are **true** or **false.**

1944
True or False Questions

	True	False
1. The stages in the development of a flea are: egg, larva, pupa, and adult.	.....	.....
2. Fleas came from winged ancestors.	.....	.....
3. Chemical controls are based entirely on the structure of the mouthparts.	.....	.....
4. The house screen is a mechanical control.	.....	.....
5. The use of rat tanglefoot boards is a mechanical control.	.....	.....
6. Female rats are more susceptible to red squill poisoning than male rats.	.....	.....
7. Bedbugs must have blood to permit reproduction.	.....	.....
8. Mosquitoes must have blood to permit reproduction.	.....	.....
9. Ham mites are the smallest insects commonly seen by the pest control operator.	.....	.....
10. The clothes moth normally requires 4 years to reach maturity.	.....	.....
11. Fleas glue their eggs to the hair of dogs and cats.	.....	.....
12. The fire brat is one of the few insects having eight legs.	.....	.....
13. Clothes moth adults feed upon wool and feathers.	.....	.....
14. Termites conduct shelter tubes mainly to protect themselves against ants.	.....	.....
15. Carpet beetle larvae molt from 5-11 times during the course of their growth.	.....	.....
16. Oriental roaches never have wings.	.....	.....
17. Bedbugs are known to carry germs of at least one human disease.	.....	.....
18. Some spiders have wings in the adult stage.	.....	.....
19. The black carpet beetle is also known as the "Buffalo moth".	.....	.....
20. The angoumois grain moth is often mistaken for the clothes moth.	.....	.....
21. Roach and "water bug" are different names for the same insect.	.....	.....
22. Cigarette beetles must have nicotine in order to live.	.....	.....
23. A pest control operator does not need to know how to identify insects.	.....	.....
24. The black widow spider has six legs.	.....	.....
25. "Silver fish" and "fire brat" are different names for the same insect.	.....	.....

(For correct answers see page 33.)

Insect Repellent Improved for Army

The Quartermaster Corps in collaboration with the Surgeon General's Office has adopted a "shotgun" type formula for an insect repellent for use of American soldiers, the War Department reports, according to Oil, Paint and Drug Reporter.

The formula for the new repellent, says this same source, has not yet been made public, but it is reported by the department that it combines the active ingredient of the two types of repellent now in use together with certain other ingredients which makes it effective against nearly all kinds of flying insects. It is expected to replace the older types entirely in 1944 for protection against all types of mosquitoes and also to provide greater protection from flies, gnats, and other insects.

The effectiveness of the repellent does not extend for any great distance. Mosquitoes have been observed to approach within a half-inch of the protected skin area before shearing off. Even if they don't bite, insects flying around the face and eyes cause untold annoyance, and chemists are continuing the search for a compound which will be effective for greater distances.

BEPQ 1943 Annual Report

"SINCE THE ENTRY of the United States into the war the work program of the Bureau of Entomology and Plant Quarantine has been subject to frequent revision with the objective of focusing it on those projects most immediately related to the war," says Dr. P. N. Annand, chief of the Bureau of Entomology and Plant Quarantine, in his annual report to the administrator of the Agricultural Research Administration.

Among the outstanding accomplishments of the year, says Dr. Annand, has been the development of the aerosol "bomb" and the material dispensed by this revolutionizing device. The aerosol "bomb" is a small cylinder that spreads insecticides under high pressure. The aerosol is made by dissolving pyrethrum extract and sesame oil in a liquified refrigerant known commercially as Freon. Diminishing supplies of pyrethrum and Freon, however, have led to research which indicates that methyl chloride and other materials can be substituted for the Freon.

One of the results of the war was the cutting off of supplies of certain critical insecticides and the material reduction of others. Among the new materials investigated as substitutes for these materials was a material popularly known as DDT. This substance was found to be tolerated by plants and was found to be highly toxic to many household and other insects affecting man and to many kinds of insects that attack food crops.

In the global war now being waged, says the report, the control of disease may be as important as military strategy. Malaria, yellow fever, dengue, filariasis can be carried only by mosquitoes. Bubonic plague is transmitted only by fleas and typhus fever only by lice. Three good repellents that will protect the fighting men from attack by flies, mosquitoes, and certain other insects have been recommended for use to the military forces and a new larvicide to kill the young mosquitoes while they are still wigglers in the water is more effective than any previously known.

Improved methods of fumigation of clothing and equipment of the military forces have been discovered and are being put into general practice, one for delousing large quantities of clothing in a short time and the other for the use in treating the individual's clothing and equipment. One of the new insecticides is so effective that treated clothing will kill body lice even after several washings. The Bureau has given special service to 43 Government agencies in the control of insect pests of food and clothing.

Another development of the Bureau has been a method of treating tide-drift grass material to kill fly maggots, thus practically eliminating the attack on military personnel and others by dog flies. These were seriously interfering with military operations in the southern coastal areas.

On the other hand, says Dr. Annand, the protection of crops and food products from insect depredations is of about equal importance to the protection of man himself. An entirely new field of research work in entomology has been the development of plants which of themselves have a resistance to insect attack. Outstanding among these has been a club type wheat which has been developed—in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering and the California Agricultural Experiment Station—which has a high degree of resistance to the hessian fly. A small quantity of this seed wheat has already been released to California growers. Another type of wheat possessing resistance to stem rust, bunt, and root rot, as well as to the hessian fly, is being increased for immediate release in California, and varieties resistant to hessian fly are well advanced toward release in Kansas and Indiana.

Cooperative work with State Experiment Stations in Illinois and Indiana have developed varieties of field and sweet corn that are resistant to the corn ear worm, probably the worst single pest of corn. Similar cooperative work on the development of corn hybrids for the Southern States is under way. New Varieties of sugarcane have been tested and three of these have shown promise of being highly resistant to sugarcane borer.

Natural resistance of certain varieties of wood to damage by termites and rots has been discovered and information furnished to the Inter-American Highway engineers.

Objective Is Ants

From Time Magazine:

At a Georgia air base a harassed captain sat down and wrote this note:

To Medical Supply Officer:

1. Following telephone information from your office that you were unable to issue carbon disulphide for use in this office in ant control, and following receipt of your letter listing insect repellents furnished by your office, request was made of quartermaster for carbon disulphide for use by this office in ant control. We were informed by quartermaster that they could only issue such preperation if the ant to be exterminated was in the building. If it was outside the building the issuance of such preparation properly should come from engineering.

It is difficult to determine the intentions of the ants we are attempting to exterminate. Some live inside and wander outside for food, while some live outside and forage inside for food. It is a rather difficult problem to determine which ant comes from without and is what you might call an engineering ant, and which ant comes from within and would be called a quartermaster ant. Some of our ants appear to be going in circles and others apparently are wandering at random with no thought of destination. Such ant tactics are very confusing and could result in a quartermaster ant being exterminated by an engineering poison, or an engineering ant exterminated by a quartermaster poison, which would be contrary to the letter of regulations and would probably lead to an extensive investigation and lengthy letter of explanation.

2. In view of the fact that quartermaster issued poison has been found to kill an ant just as dead as engineering issued poison—and vice versa—request is made that your office draw identical poisons for issue to this office from both engineering and quartermaster, and mix same so that there wil be no way of knowing which poison killed the ant—the assumption being that no well bred G. I. ant would eat other than poison issued through proper channels to final destination, which destination being the aforementioned dead or dying ant.

HERE'S GOOD NEWS FOR PEST CONTROL OPERATORS:- PRE-WAR RUBBER BELLOWS ARE BACK IN PRODUCTION!

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The Bureau of Entomology and Plant Quarantine and Wartime Pest Control

By S. A. ROHWER, *United States Department of Agriculture, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine*

This article has been prepared to follow the outline used for a talk made at the War Emergency Meeting of the National Pest Control Association, St. Louis, Missouri, October 25, 1943. The information included and the nature of the comments are substantially the same as the oral presentation.

ASSOCIATES IN PEST CONTROL—that is how I consider you members of the National Pest Control Association—it is a pleasure to greet you on behalf of the Bureau of Entomology and Plant Quarantine. In the vast and important field of pest control—activities essential in peace and war—I think you may be likened to merchants. While this may be the general relationship there is one fundamental difference and that is this—your job, if done well, requires training, experience, and scrupulous attention to details. You use the research of others and the equipment and materials supplied by industry. But you have to know how to do this and that "know-how" is where your industry becomes one of specialization. Basically the purpose of your task is the same as that of the applied entomologist, for you also strive to protect supplies, materials, and the health, happiness, and comfort of man from insect pests.

Since we are associates in the all-important field of pest control, it may not be out of order to tell you something about the organization it is my privilege to represent. What is the Bureau of Entomology and Plant Quarantine? It is a regulatory agency, as it is responsible for the enforcement of laws aimed to prevent the introduction of insect pests and plant diseases into our country and the spread of those which are new to or not widely distributed in our country. This is a big and important task.

The Bureau is an action agency. We, in cooperation with State, local agencies, and private individuals and organizations, carry out operations to control, suppress, or eradicate pests which destroy food, fiber, and supplies.

The Bureau is an important research agency. It is the unit of the Federal Government that is charged with determining facts about insects—how to control those which are injurious and utilize those which are beneficial.

The Bureau is a service agency. We are responsible for giving advice on insects, what they do, how they behave, and how they may be utilized or combated.

While these are in general the things the Bureau is responsible for, there are some things intimately associated with present-day pest control that are not our responsibility. The Bureau is not a claimant agency for supplies and materials needed in pest control. It is not an agency which allocates or distributes supplies. It is not an agency to manufacture insecticides and equipment. Its relation to these activities is only that of an adviser when advice is sought. We are glad to serve in this capacity and pleased that our advice is sought. We have frequently been consulted by those concerned in insect problems and the allocation and distribution of supplies needed to combat pests. Requests for advice have come from many governmental agencies. The Army, the Navy, Public Health Service, War Production Board, Office of Price Administration, Office of Economic Warfare, Office of Civilian Supply, and the War Food Administration are the units with which contacts are most frequent and direct.

The numerous problems of pest control are always with us. To be of the greatest and most direct help in this struggle for freedom the Bureau has, however, revised its program so its activities are all directed to the war effort. The war and things associated with it increase the opportunities for the introduction and spread of pests. Important as these problems now are they will be of greater importance and present many new angles when our fighting forces return and commerce is resumed. Pest control operators can and do help in this work by reporting new pests and those which are unusual.

The need for facts to aid in developing means of controlling pests is especially great in these times of shortages in supplies, materials, and labor. Facts assembled through earlier work give a background of information useful in all emergencies. They are not in themselves adequate to meet the new conditions. Research to provide information to meet military needs and to produce and protect food and fiber for ourselves and our allies receives our full consideration. Notable results have been achieved in developing ways to protect our armed forces from annoying and disease-carrying insects. Devising equipment, formulae, dosages for fumigants that can be used in combat areas to free clothing from body lice, and perfecting two methods of killing body lice that can be used by the soldier at the front have done much to reduce losses that may be caused by typhus—that ally of the enemy. The most recent formula provided a substitute for a critical insecticide needed for an important military use.

Repellents for mosquitoes—carriers of dangerous diseases and enemies of efficiency—which give protection for hours, not minutes, have reached new heights of effectiveness. When these can be made generally available after the war civilians may find greater pleasure in all out-of-door occupations in mosquito areas.

Useful as repellents are, they are not the entomologist's first answer for the war against mosquitoes. We prefer dead mosquitoes rather than those which have been driven away. Research to improve ways of killing adults and larvae has produced new sprays and larvicides and methods of using them. The use of aerosols—the chemist's name for a smoke or a fog—is an outstanding development. A highly effective aerosol is produced when a toxic material is dissolved in a liquid gas that boils when released and propels minute particles of the insecticide into space, where the insect comes in contact

with them—a procedure quite different from aiming a spray at the pest.

Achievements have not been restricted to improving controls for insects which attack man. Better ways have been devised to protect stored grain from insects. The fumigants which have proved to be effective for this purpose will be of use in some of the operations carried on by members of your Association.

The need to produce maximum supplies of food and fiber has increased the importance of controlling pests that would destroy them. Action programs have this objective and have produced results. Cooperative control operations prevented range grasses from being devoured by grasshoppers, thus saving them to feed cattle that produced beef which would not otherwise have reached the market. Ten million pounds of beef was part of the reward from work in one section of the Arizona range. The destruction of barberries that harbor a disease which limits the production of oats made it possible to so increase the yield of this crop that farmers did not have to rely on dairy feed hauled by overworked transportation systems. This had a significant effect on the amount of milk produced near one of our large cities. Facts secured from field surveys that disclosed where insect enemies of cotton were threatening the yield of this essential food and fiber crop aided manufacturers to send insecticides where they were needed. The insect losses for the crop of 1942 were held to average, even though the pests were so abundant that abnormally high losses seemed certain.

Research to develop insecticides to replace those for which the supply is short and to determine how to use those which are available to get better results has high priority in the Bureau program. You know of the shortages of some materials and will appreciate why. Hundreds of materials have been developed and tested against many kinds of insects. Some of these are what we class as promising, and these are being tested further. Work of this nature takes time. It is not always possible to keep test insects active throughout the year. This is only one of the tasks that confronts those who endeavor to develop new insecticides. I wish there were some specific new material to offer you for use in your fields of pest control. Unfortunately, there isn't much right now. For some pests you can shift, as some of you have, to certain organic thiocyanates. Some of these which are useful are commercially available. When you use them it is

(Continued on Page 31)

FUMIGATION NEWS

ZYKLON DISCOIDS

Published in the Interest of Pest Control Operators by the Insecticide Department of
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Any concentration of human beings almost invariably promotes conditions favorable for propagation of vermin. And crowded housing brought on by wartime concentration of large portions of the population in defense plant areas has resulted in a vital need for expert pest control.

The Pest Control Operator is in great demand and it is up to him to make his services available. For this kind of

Insect life can be completely destroyed by fumigation with ZYKLON DISCOIDS.

activity can have a very direct effect on the successful operation of the war. Workers engaged in turning out war materials cannot be expected to perform efficiently if they have to live and sleep in vermin-infested houses. Here is a splendid opportunity for the P.C.O. to step in and afford them necessary and qualified help in meeting a real problem.

The smart P.C.O. fumigates with ZYKLON DISCOIDS. Approved by Governmental and Sanitary Authorities, hydrocyanic acid gas, the active ingredient in ZYKLON DISCOIDS, is one of the most effective agents known for the destruction of vermin and insects.

WHY ZYKLON DISCOIDS ARE IN DEMAND

1. There is no unnecessary bulk or weight. The gross weight of ZYKLON DISCOIDS is considerably less than the equivalent in "killing power" of any other fumigating medium. This is a decided advantage, not only because of the lesser bulk weight to be handled, but also because of the large saving in transportation charges.

2. Portability and flexibility in use. A sufficient quantity of DISCOIDS for a good-sized household-fumigation job may be carried in an ordinary suitcase.

3. No apparatus required. Nothing to transport from the job but a can opener and a gas mask.

4. Speedy fumigation. Fumigation can be completed in less time than by other methods.

5. Cleanliness. There is no dust or dirt with ZYKLON DISCOIDS, no danger of acid burns, no weighing and mixing of chemicals.

6. No dangerous residue. The inert DISCOIDS can be easily disposed of after the fumigation.

7. Uniformity of fumigation. A better fumigation can be obtained with DISCOIDS. Predetermined dosages can be distributed at will.

8. Economy. The cost of fumigating with ZYKLON DISCOIDS is less than with any other modern fumigant, excepting only Liquid HCN, which is adapted to larger operations.

RATS NO LONGER A PROBLEM IN NEW ENGLAND TOWN

A well-populated New England town, which used to have a big rat problem, waged a successful campaign against these disease-carrying and destructive pests with the aid of CYANOGAS.

Report has it that where passersby used to see a mound completely covered with feeding rats, now there are none. Estimates of the number of rats killed range from 50,000 to almost astronomical figures. In one mound alone at least 5,000 rats died within a minute or two after inhaling the gas. And only 600 pounds of CYANOGAS were required for the complete job.

CYANOGAS was the main attacking weapon. Applied by several different methods, it was forced through the miles of burrows in every part of the dump. The workers applying it would keep pumping it into a hole until it was seen seeping out from other holes hundreds of feet away.

Research Tests on Soil-Poisoning Chemicals For The Control of Subterranean Termites [1]

By **IRA HATFIELD**, *Development Department, Organic Chemicals Division, Monsanto Chemical Company, St. Louis, Missouri*

THE INFORMATION given in this paper deals with two phases of research on soil-poisoning chemicals for the control of subterranean termites. The one phase refers to the Monsanto methods of testing soil-poison chemicals; the other deals with the data obtained on both termites and chemicals during a five-year period just completed.

Before the initiation of the Monsanto program in 1938, a study was made of the published methods of conducting soil poison tests, with the hope that we could profit by the shortcomings of other tests and incorporate the good points from the existing methods in order to make the new tests as successful as possible. A review was made of the test methods used by the United States Bureau of Entomology at Fall Church, Virginia (4), and at Long Island, New York (6), by the University of Illinois (3), and tests reported upon by Kofoid, Light, et al (1).

The three areas chosen for our tests were selected on the basis of the following controlling factors:

1. High incidence of termites.
2. Possible protection from vandalism, fire, animals or other disturbing factors over the period of test.
3. Difference in soil types in the different areas.

The sites selected were at Nitro, West Virginia, where the soil was classified as heavy clay (Figure 1), at Saucier, Mississippi, where the soil was classified as Ruston sandy loam (Figure 2), and at Gainesville, Florida, where a white sandy soil rich in humus existed (Figure 3).

Briefly, the tests were installed as follows:

A plot was laid out in rows five feet apart, and uniform round holes 15 inches in diameter and 16 inches deep were dug in each row at five-foot, three-inch intervals, center to center. The holes in alternate rows were staggered so that any three adjacent holes formed a triangle. In installing the tests, the side walls and floor of the holes were sprayed with the chemical being tested, and the dirt removed from the holes was sprayed as it was backfilled. Ten specimens of Southern Yellow Pine (2″x4″x18″) were set in the treated soil for each treatment or concentration of treatment in each of the three plots.

The specimens were set with 9″ extending above and 9″ below the ground line. The soil surrounding eight of the 10 specimens was completely treated, whereas the other two specimens were "trenched," i.e., only a three-inch layer of soil at the middle of the below-ground portion of the stake received the chemical. The tests were left unmolested for one year, at which time all stakes were carefully removed, readings taken, and the stakes replaced. This procedure was followed each year for five years, the last reading being taken in October, 1943.

Figure 1—Photograph of termite soil poison test area at Nitro, West Virginia.

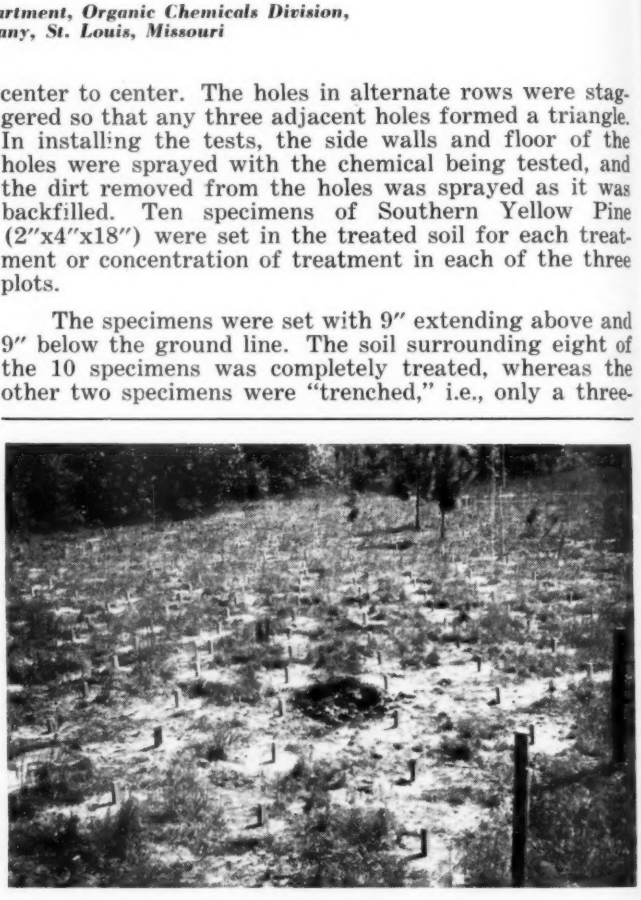


Figure 2—Photograph of termite soil poison test area at Saucier, Mississippi.

The selection of chemicals for these tests was not based alone upon the then commercially recommended chemicals for this use. The tests were established primarily to determine the potential value of a number of chemicals which we believed might be of possible use for soil poisoning. Hence several new chemicals were investigated, and results show that some of these new chemicals are superior to any organic compound proposed for this use to date.

Before presenting data on these tests, a word of comment on the test methods used by Monsanto is in order. Up until the time these tests were established, there was little data in the literature on the establishment of termite soil poison tests. In 1938, von Schrenk et al (5) published data on a five-year test initiated by a committee of the American Railway Engineers' Associa-

tion. In 1939 at a Third Pest Control Operators' Conference at Purdue University, McCauley (2) called attention to the fact that more and more experimenters were becoming interested in soil poison tests, and stressed the fact that there was a definite need for a standardization of methods for studying soil poisoning chemicals. In October, 1939, a number of interested persons met in Washington, D. C., and drew up a recommended method of procedure. It might be mentioned here that in general, the method used by Monsanto in 1938 is in accordance with the procedure recommended at that conference, and later tests established by us have been in accordance with this procedure.

In presenting the data on our five-year tests, we will divide the discussion into three parts, namely:

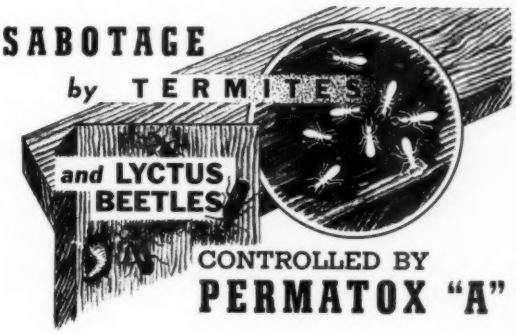
1 Correcting popular misconceptions about termite habits,
2. Further suggestions about making soil poison tests, and
3. Facts we obtained about the chemicals being tested.

Unfortunately, space will not permit us to do more than refer to some of the misconceptions we have observed concerning termite habits and the application of soil poisons. In the first place, our results definitely indicate that it is risky for Pest Control Operators to guarantee good results unless the chemical is well distributed throughout the soil. The "layering" type of application has shown that only the portion of soil containing an effective chemical can be expected to act as a barrier to termite penetration of the soil, unless the chemical is extremely volatile and the vapors are toxic to termites. In such cases, permanence would be a factor to consider.

This point can be further expanded to bring out that the policy of leaving a few inches of untreated soil at the ground level to prevent destruction of grass or other vegetation is a dangerous policy, for termites can actively work in this untreated soil. Unless a chemical is found which is non-toxic to vegetation, but suitably toxic to termites, vegetation may have to be sacrificed if absolute termite control through soil poisoning is desired.

Another point studied was the possible relationship of decay to termite attack. The statement is often made that termites will enter wood only after the wood has started to decay. Our results, based upon the examination of over 1600 specimens, show that decay is not a prerequisite for attack by subterranean termites. Conversely, we found no evidence that termite attack necessarily induces decay. It can be stated, however, that if

Figure 3—Photograph of termite soil poison test area at Gainesville, Florida.



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conditions are suitable for decay, termite attack is likely to occur more readily and progress more rapidly. Also, termites often carry soil and humus into the wood, especially if they become well established, and this increases the moisture-holding capacity of the wood, thereby improving conditions necessary for decay.

Another misconception is that termites require shade, poor ventilation and poor drainage as adjuncts to tube building. Although these factors play an important role in aiding tube building in structures, their absence does not prohibit tube building.

Although the tests at Saucier and Gainesville were in forest clearings, the test at Nitro was on Monsanto property where the vegetation could be cut with a mower whenever desired. The grass between specimens in the Nitro area was kept well mowed, and an actual study was made of tube building on specimens around which the grass was hand-cropped every week. This was augmented by observations of specimens where the chemicals had completely retarded the growth of vegetation. In cases where the chemicals acted as herbicides but were non-toxic to termites, the termites readily built tubes to the tops of the specimens. Likewise, good ventilation and good drainage was present at the three test plots, yet tubes were built. The only discouraging factors to tube building seemed to be excessive rain washing or rapid deterioration of the tubes composed largely of sand at the Florida plot. Even in these cases, tubes were built in order to facilitate termite attack of the tops of the specimens.

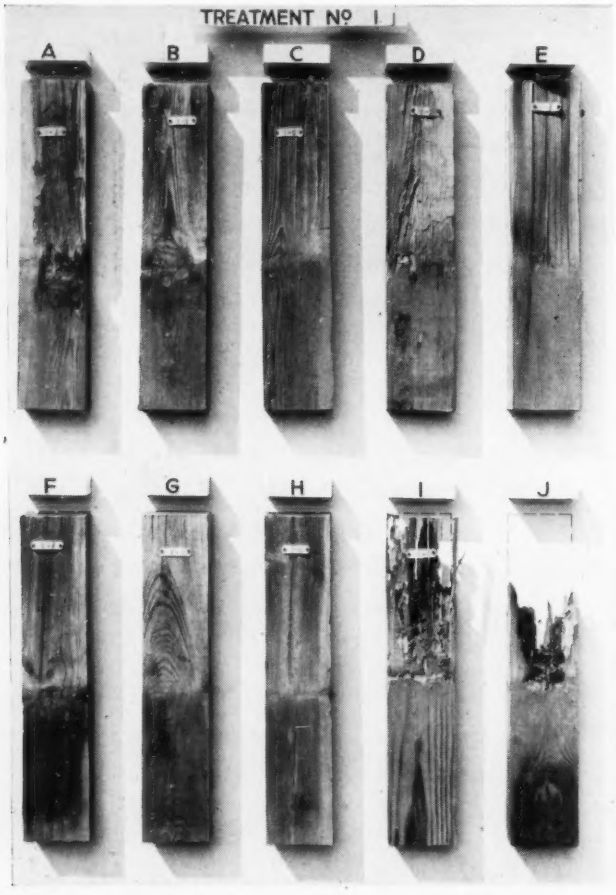

Figure 4—Photograph of specimens after 5 years' exposure in soil treated with Permasan (5% pentachlorophenol in Petroleum oil). Concentration of Permasan approximately one quart per cubic foot of soil.

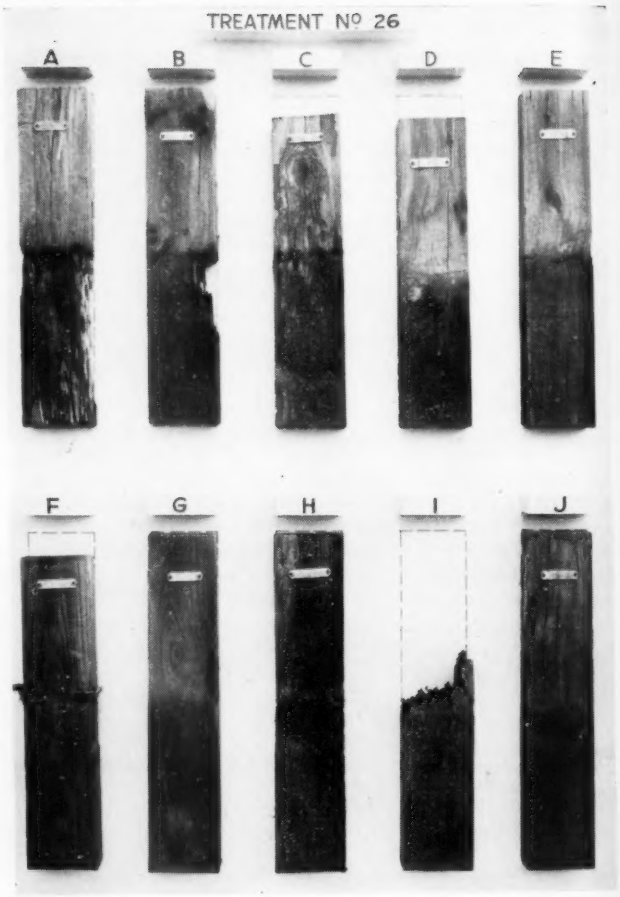

Figure 5—Photograph of specimens after 5 years' exposure in soil treated with trichlorobenzene. Concentration approximately two fluid ounces per cubic foot of soil.

We will mention only one other misconception, and that is that ants and termites cannot exist in close proximity. It is true that ants are deadly enemies of termites, but termites can and do establish themselves in areas occupied by ants and can actually carry on their destruction in wood, a portion of which is occupied by ants. This is made possible by the ability of the termites to keep their galleries and tubes impervious to the ants.

Now a word about making future soil poison tests. We have under test chemicals which will give more than five years' service, but, believe it or not, the portion above ground did not always last as well as the below-ground portion, and as a result, in many cases there was no above-ground portion left with which to remove the samples. If it is desired to continue tests longer than five years, some kind of cap for the specimen should be devised to retard undue checking, moisture penetration and subsequent decay in the above-ground portion.

It was noted that in many cases of good treatments, decay started in the checked top of the specimen and spread progressively downward, sometimes internally even below the ground line. Another point that should be thoroughly stressed is the importance of driving the specimens tightly into the soil and tamping the earth tightly around them to prevent air pockets around the specimens. This is important both at the time of installation and examination of specimens. It has been

amply demonstrated by our tests that if the earth is not tamped tightly around the specimens, they will decay badly, sometimes in only one year.

Aside from these suggestions, and augmenting the statements which appeared in the method outlined by the October, 1939, group at Washington, it appears that the Washington method is satisfactory.

How about the chemicals? Did any of them stand up 100% for five years? On the basis of these studies, what shall we recommend?

In answer to these questions it can be stated that no chemical under test at the concentration tested stood up 100% at all three plots for the five-year period. However, one treatment did stand up 100% at one place, and it might be added parenthetically that it was among the best treatments at the other two areas. These facts cannot be interpreted to mean that no chemicals were effective for termite soil poison work. In some cases, the attacked specimens were the ones where the treatment was "trenched" as previously mentioned. In other cases, too low a concentration of chemical was used. In still other cases, the termites attacked the specimens lightly and then left, indicating that the chemical was toxic or repellent to the termites. Such attack still was recorded as attack in the final tabulations, which would

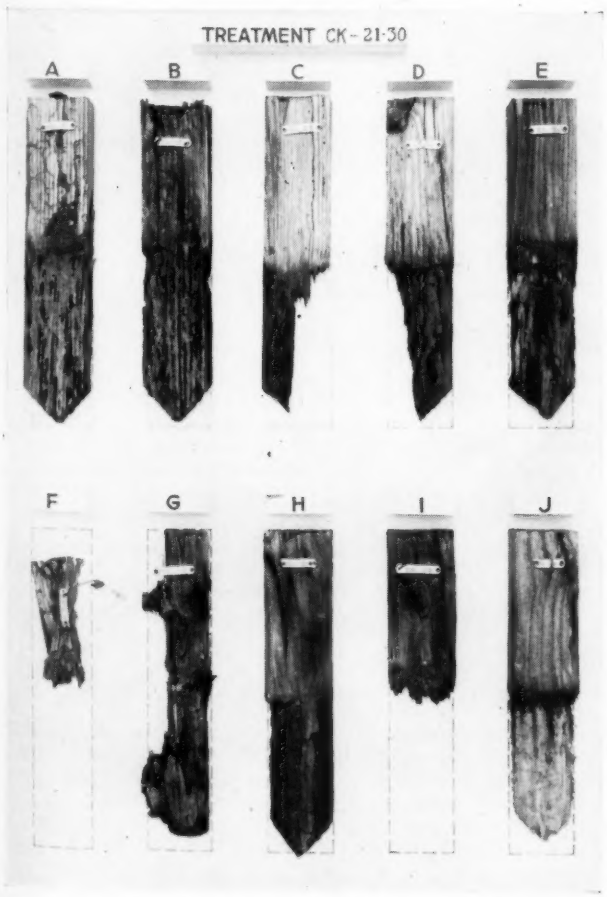

Figure 6—Photograph of control specimens. As the original controls were heavily attacked by termites and decay, they were replaced with new ones after two years. The specimens in this photograph had been in test only three years.

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automatically throw the treatment in a lower bracket on the percentage basis.

This whole study being a research project has involved the testing of a variety of products, a number of which were experimental chemicals only. These five-year tests have shown that some of these newer chemicals have value as soil poisons, possibly surpassing in some respects those now used. Since these chemicals are not available and cannot be available during the war period, it is deemed best not to identify them by name lest confusion, rather than true progress, be the result.

If these new materials prove economical to produce and apply, they will be announced at a later date along with pertinent information as to their effect on vegetation and decay prevention, as well as their termite insulation value.

In summary it can be stated that analysis of our data shows that ultimately valuable new compounds will be available for use as soil poisons against termites. However, the presently used pentachlorophenol and mixture of it with trichlorobenzene are among the best treatments studied. For the time being and to the extent that they are available, the termite control operator has confirmation in these tests of the value of these materials which have already been made available to him.

Figure 7—Photograph of specimens after three years' exposure in soil treated with a 50/50 mixture of Permasan and trichlorobenzene. Concentration was one pint mixture per cubic foot of soil. Note excellent condition of all specimens.

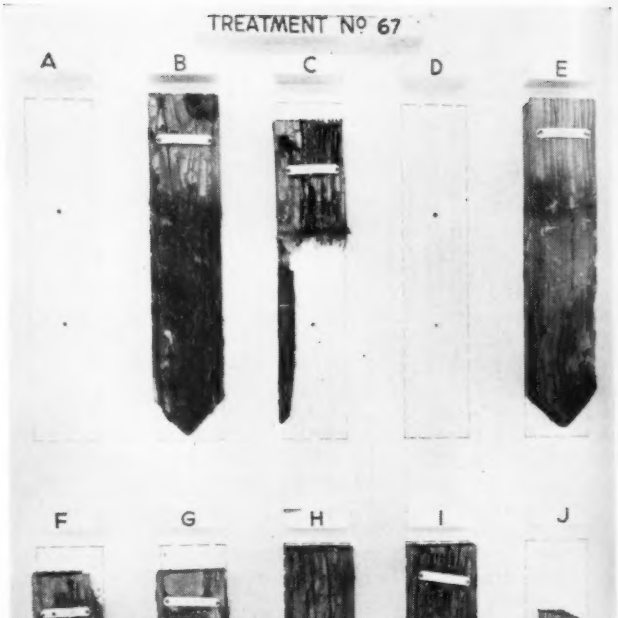

Figure 8—Photograph of control sepcimens installed at same time as specimens in Figure 7.

[1]This article was presented at the National Pest Control Association's 11th Annual Convention held at St. Louis, Mo., October 25-27, 1943.

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RAT CAUGHT IN BELT CAUSES TAVERN BLAZE

Dunkirk.—A rat caused a fire at the Rendezvous Restaurant soon after the place closed after its New Year's festivities. Firemen found the rodent was caught in a compression belt leading to the beer-dispensing equipment, resulting in a short circuit from which the fire originated. The damage was small, according to Fire Chief Louis Cieslewicz, newly appointed head of the fire department.

—*Buffalo Courier.*

The Basic Responsibility of the Pest Control Operator to His Client

By E. GORTON LINSLEY, *University of California, Berkeley*

WHAT IS THE BASIC responsibility of the pest control operator to his client? I imagine that such a question directed to a half dozen individuals would elicit as many different answers. One might answer that it was to provide a reasonable charge for services, another to make a thorough inspection or to do an honest and workman-like job, a third to please the client or to employ truthful advertising, and so on. I do not deny that these and other considerations are actually important factors, but in my opinion they avoid the main issue, the one which is absolutely necessary for the achievement of all of the ideals which may serve as a goal for the operator. This is the obligation of the operator to properly identify the species involved. As elementary as this may seem, it is my conviction, that inaccurate identification is the greatest obstacle to ethical and satisfactory pest control operations. The operator may have an entirely adequate knowledge of chemicals and methods of pest control, he may be well informed on the habits of pests, he may be expert with tools and in handling structural materials, he may be a good business manager, in fact he may have all of the other qualifications desirable but if he cannot properly diagnose through recognition of the species concerned, the other qualifications are of little value to either the operator or his client and an ethical practice is impossible. True, he may be able to provide temporary satisfaction for a client, to relieve the mind of an anxious housewife, but he cannot actually render the service for which he is collecting his fee.

Let me illustrate. In my experience probably 25 per cent of the insects which cause worry or dismay to the householder are casual, that is their presence in the home is not a threat to the structure, furnishings, foodstuffs, or any of the materials which the householder is interested in protecting, or to his health. They may, of course, provide a source of much annoyance to the client but the client should be fully informed of these facts before control measures are undertaken. Furthermore, since these casual species do not breed in the household, ordinary chemical control measures are impracticable. For instance, in the fall and winter months many kinds of insects regularly invade houses seeking hibernating quarters or temporary protection from the cooling weather out of doors. In California, the commonest species involved are elm leaf beetles, tule beetles, box elder bugs, corizid plant bugs, and harmless spiders. I have had cases called to my attention where homes were fumigated to eliminate one of these nuisances only to have a new invasion occur a day or two later. Naturally the clients were dissatisfied. Casual insects of this type should be recognized for what they are and in actual practice little can be done toward their control beyond either the elimination of ports of entry or of the infestation foci out of doors. When the householder fully understands the situation and has been made to realize that valued linens, upholstery, rugs, the house itself, and his health are in no serious danger, and that the infestation will be of but a few days' or at most of a few weeks' duration, he can generally be satisfied.

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Another common source of casual household insects is firewood. A great variety of species breed in freshly cut firewood. Most of these pass the winter in a fully developed or nearly mature state, remaining in the wood until the favorable conditions of springtime stimulate their emergence. When firewood is brought into the house in the cool months of the year, the insects respond to the higher temperatures and emerge, flying about the room and frequently gathering in large numbers on window-sills, to which they are attracted by outside light. Among the commonest of such insects are bark beetles and certain bostrichids and anobiids. These bear a very deceiving resemblance to other beetles which attack structures or breed in stored food and drug products, and provide a rigid test of the operator's ability to properly identify insects. However, if he can recognize the species, their source can be eliminated and the client satisfied. Failure to make a correct identification may result in wasteful and unnecessary application of chemical control procedures which may completely fail to eliminate the insects, especially if, as is so often the case, the firewood is stored in the basement or outside the house with but a small amount kept by the fireplace for use. Whenever a new supply is brought in and left unused for a few days a new lot of insects will appear.

Even foodstuffs may provide a source of insects which are casual in so far as the household is concerned. The pea weevil infest peas in the field and later emerges in storage. It does not, however, re-infest dried beans and peas as does the deceptively similar bean weevil. It is essential that the two be distinguished before an ethical control procedure can be formulated.

With these few examples from among the many casual household insects, let us consider the more regular inhabitants of structures. We all recognize that most of the control measures applicable to subterranean termites are of little or no value for drywood or dampwood species, and that baits satisfactory for the control of one general type of ant will be consistently refused by another. To what extent, however, do such differences apply to other household forms? I think much farther than is generally recognized. For instance, it is a general practice to apply one of two or three baiting methods for the control of carpenter ants, a different set for Argentine ants, another for harvester ants, etc. However, an investigator has recently shown that the standard carpenter ant baits which appear to be satisfactory for eastern species are of very doubtful value for the most destructive of our western species. A second investigator has found a somewhat analogous situation with different species of silverfish. We know from our much wider experience with agricultural pests that related species react quite differently to the same baits and we should not be surprised to find that the same is true for their relatives that live indoors.

With regard to insects infesting fabrics and other materials within the home, it is necessary to know the species in order to eliminate the source of the infestation. It is insufficient to recognize that a species is a carpet beetle because the different carpet beetles have very different habits. In California, the buffalo carpet beetle appears to confine its attacks to woolens and animal products but the more common varied carpet beetle breeds also in food materials of plant origin. A recent case came to my attention where fumigation of closets, rugs, and upholstered furniture had failed to eliminate a household infestation. It later developed that the beetles were breeding in a flour bin in the kitchen and spreading from it to the rest of the house. Black carpet beetles may be breeding in a rat's nest in the attic; the western carpet beetle may be coming into the home on cut flowers. The same differences are evident among the clothes moths. The webbing clothes moth may be maintaining a focus for infestation in dry animal or human foodstuffs; the brown house moth may be breeding in fungi in the unfinished part of the basement. Proper identification is essential to the solution of the control problems.

Similar principles obtain with the numerous species infesting stored food products. The granary weevil, rice weevil, and lesser grain borer confine their attacks to rice, grain, certain seeds, macaroni and caked cereals, the bean weevil to various kinds of beans and peas. This knowledge makes the control of these species in the household a simple matter. The drugstore beetle on the other hand, breeds in nearly all dry plant products including spices and drugs and may even bore in wooden containers and bins. Unless the various sources for the infestation are eliminated no amount of spraying or fumigation will solve the problem. Again, proper identification is at the basis of satisfactory control.

One further example of the importance of accurate identification will, I think, suffice. This we may select from the beetles attacking structural woods. Most of these are rather specific with regard to the woods which they infest. If powderpost beetles appear in a house we know that they are infesting hardwood products and our attention can be confined to hardwoods alone. However, the Old World powderpost beetle, in California at least, is most commonly found infesting bamboo. If this species is identified the source can be quickly located. With deathwatch beetles, identification is even more important because some of the species confine their attacks to coniferous woods, others to hardwoods, still others infest both.

Warning clouds are already appearing on the horizon which indicate that the client himself is at least dimly aware of these problems. As a result of popular writings, radio programs, and national advertising, the public is becoming better informed. The "victory garden" program, to cite but a single example, has made millions of Americans pest-conscious for the first time. In an effort to solve their pest problems they have had to turn to newspapers, magazines, radio broadcasts and publications of state and federal agencies for definite information. In the course of their inquiries they have of necessity picked up much information about other pests. They have also learned that state and federal agencies will identify pests which are sent to them. This is already being reflected in an increasing number of samples being sent to such agencies by householders who wish verification of identifications made by pest control operators. These agencies as public servants, cannot be expected to "cover up" for the operator. In fact, frequently they have no way of knowing that a particular request is actually intended as a check upon information which they have received from another source.

How then may the operator meet this basic requirement of pest control operations? The solution is not easy. It requires hard work, intensive study. The regional pest control conferences offer but a partial solution. At best they can hope to do litle more than familiarize the operator with materials and methods and with sources of information helpful in the identification of species. This is, however, the first and by far the most important step in attacking the problem. From this point onward the operator must carry himself by means of personal study. In order to do this he will require certain tools. The first of these is a dissecting microscope or at the very least a good hand lens (magnification 10x or 14x).

Satisfactory identifications can rarely be made without magnification. The second requirement is adequate references for guidance. The manual prepared for the 6th Pacific Coast Pest Control Conference is a long step in this direction. However, in addition to this, one or more of the following works would be helpful: Essig, College Entomology (Macmillan); Insects of Western North America (Macmilan); Metcalf and Flint, Destructive and Useful Insects (McGraw-Hill); Fernald, Applied Entomology (McGraw-Hill), various federal and state publications may be used to supplement these. Finally, the operator should maintain a reference collection of accurately identified specimens for comparison. Such collections can be purchased from various biological supply houses, notably Ward's Natural Science Establishment at Rochester, New York, or can be accumulated by the operator himself after checking with competent authorities to be sure the identifications are correct. Finally, however, all of these tools are to no avail unless the operator uses them, studies his reference works and specimens, familiarizes himself with every possible detail. This cannot be accomplished in a day, or a week, or a month. It requires constant effort but in the long run will pay greater dividends than any other investment that the operator can make in his business.

In conclusion then, may I repeat that it is my conviction that the basic responsibility of the pest control operator to his client is to know and be able to recognize with a reasonable degree of certainty the various species of organisms with which he is concerned. The client's troubles must be properly diagnosed before control is undertaken or prescribed. No pest control business can be operated in an ethical manner unless it is prepared to make accurate diagnoses. Charges for services never actually rendered, wholesale waste of critical labor and materials, and a generally dissatisfied public are the only alternatives. Proper identification is the key which unlocks and makes available the knowledge which the operator himself has accumulated and enables him to draw upon the accumulated knowledge of the scientists and researchers who have investigated the field.

Rat Control Campaign

This December 7; the farmers of Delaware remembered Pearl Harbor. They made a blitzkrieg attack on one of the strongest allies of the Japs—the record local crop of rats—according to Harvey L. Chada, extension entomologist for the Delaware Agricultural Extension Service. Rats have always been a general nuisance and a menace to public health. But right now their chief interference with the war effort is in destroying feed. One rat eats or destroys about 100 pounds of feed a year, and our estimated rat population of 480,000 rats waste enough feed each year to raise about 4 million broilers to marketable size.

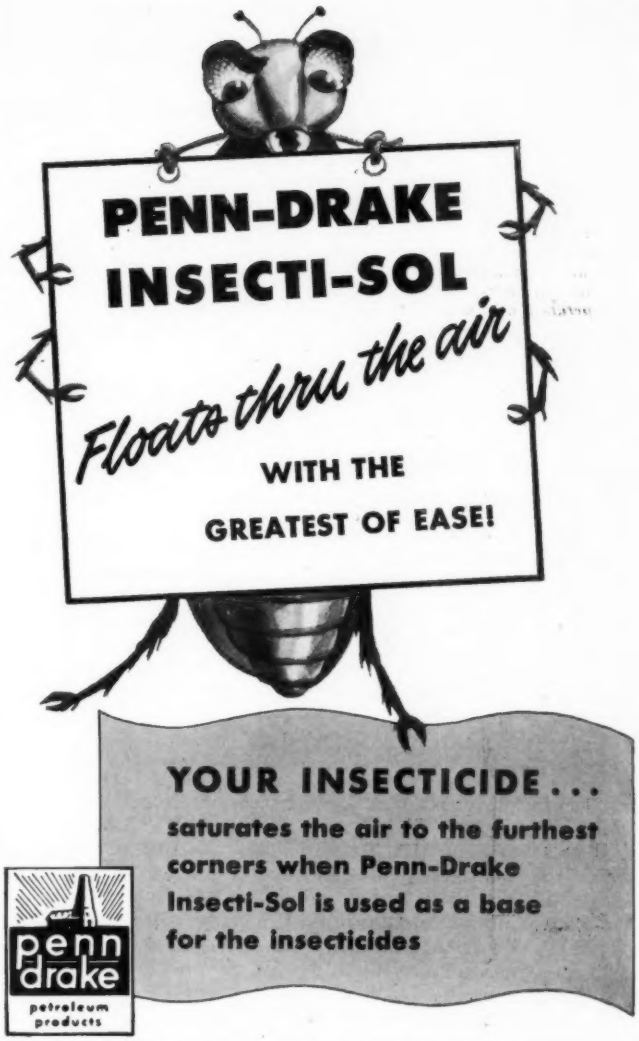
There is a serious feed shortage throughout the country, and particularly in this section where feed has always been shipped in for the broiler and dairy industries. Stretching available feed supplies to meet needs is one of the farmers' biggest problems, and prevention of the waste by rats is one of the first savings to be made.

All farmers in the state were asked to join in the campaign on December 7, since widespread control measures prevent the rats from escaping through migration. A new effective poison, zinc phosphide, was provided by the U. S. Fish and Wildlife Service, Washington, D. C. Though poisonous to all animals, the zinc phosphide can be used without danger if proper precautions are taken. Tests within the state have already proved its effectiveness in killing the rats.

After this first large scale program to kill the rats every effort will be made to keep the control effective through good feed storage and continuing the poisoning program.

Red squill is another bait and as a rat poison has the advantage of being relatively harmless to human beings and domestic animals. This is due in part to its objectionable taste.

—*Farm Magazine.*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More Chemical Meanings For The Pest Control Operator

TECHNICAL COMMITTEE, *National Pest Control Association*

EDITOR'S NOTE: *The recent Eastern and Purdue PCO Conferences became the setting for continuing discussions on chemicals. The laboratory demonstrations that accompanied the following paper delivered by C. A. Vincent-Daviss, Chairman of the Technical Committee of the NPCA, make it clear that chemistry of insecticides and other substances used by pest control operators are important. It is suggested that you refer to the April 1943 issue of Pests for the initial discussion of this subject.*

Introduction

THE DISCOVERY or development of means of communication constitutes the greatest advance by man and won for him the designation "rational animal." This communication is carried out by means of symbols. Symbols only stand for something with the intervention of "thinking." The thoughts and previous experience of the individual affect the interpretation of the symbol. In order to be sure that the other individual has the interpretation that is wished, it is necessary to enlarge on the symbol by way of definition and demonstration or by giving descriptive meanings that will assist the other person to correctly interpret the symbol.

It is true that a Pest Control operator can carry on his business without a knowledge of chemistry or an understanding of words used as symbols in chemistry, but it is likewise true that he will have a better understanding of his business if he has a better knowledge of chemistry, i.e., chemical symbols. A better understanding must lead to a sounder business and a broader outlook for that business. With this in mind a short time will be spent in presenting further meanings of chemical terms which will assist the Pest Control operator in recognizing the impact of chemistry on his business.

Elements and Compounds

Since the earliest of times man has attempted to classify the thousands of different kinds of matter. One of the oldest attempts was the classification of all kinds of matter as earth—all solids; water—all liquids; air—the winds, clouds and breath; and fire—the symbol of the sun. Symbols were used in designating these classifications. Later the Greeks tried to understand matter in a narrower sense and made their ideas in this connection systems of philosophy. One school visualized solids and liquids as being jelly like in composition, that is, no matter how many times it be divided, all parts will be alike and so to infinity. Another school considered matter as composed of discrete particles like sand. That is, division could go on until a point is reached where the part could not be further subdivided or subdivided into like parts. Experience has shown that the second school of Greeks came very close to an understanding of our present view on the composition of matter. Subdivision can be carried out to a point when it is no longer possible to subdivide further and still obtain like parts. An examination of materials on this basis will disclose two classifications, the one where the point is reached and the end parts are of the same nature as the initial material and another group where a point of subdivision is reached where the parts no longer resemble the initial product, but the parts themselves cannot be further subdivided. The first group of materials are known as elements, i.e., a substance which as far as we know contains one kind of matter. The second group are known as compounds. A compound is a form of matter in which elements are combined in definite proportions.

There are ninety-two known different fundamental types of matter which correspond to the types defined as elements. From the combinations of one or more of these 92 elements there exist hundreds of thousands of the different kinds of matter defined as compounds. Among the elements are the nitrogen and oxygen principle constituent of the air we breath; copper, arsenic, nickel, tin, zinc, lead, phosphorous, etc. Then we find among the materials we use illustrations of compounds, in arsenious oxide, a combination of arsenic and oxygen; zinc phosphide, the combination of zinc and phosphorous; hydrocyanic gas, a combination of the elements hydrogen, carbon and nitrogen. Many other examples can be given from the number of materials encountered in daily life and among the products used in our industry.

Elements and Molecules

The discussion thus far has dealt with the subdividing of matter until it is no longer possible to carry it further:

1. Without reaching a point where the parts become dissimilar.
2. Where subdivision is no longer feasible.

What is the smallest particle that can exist in a physical state? The smallest particle of matter is called a molecule. In the case of a compound it is the smallest piece of matter that can exist in a free state. It may in the case of an element, be made up of one or more smaller similar parts which are not found free or in the case of a compound consist of the union of two or more elements. Now it will be noted that in both cases the molecule is made up of one or more parts that cannot exist in a free state. These smaller parts do, however, appear to behave with independence in a chemical reaction. These smaller parts which are entities in a chemical reaction but which do not exist in a free state are known as atoms. Then molecules can be made up of one or more atoms depending upon the material under discussion. When two or more atoms join to form a new molecule, the resulting material does not possess the same properties as either of the elements from which the atoms are derived. As an example, one atom of oxygen, so useful to us in breathing, joins with two atoms of hydrogen, one of the light gases used in balloons, to form water. Water does not resemble either the oxygen or hydrogen from which it was formed. A similar of any material, the molecules of which are made up of two or more different kinds of atoms, will reveal the same observation. Thus we can understand how new materials can be made by means of chemistry. Namely: The causing to unite of different kinds of atoms, i.e. elements.

Chemical Forces

Like other forces, chemical forces cannot be isolated but are known to exist by the result they produce. If we

The Importance of Entomology in War Time

WHATEVER IMPORTANCE may have been attached to the slogan "fighting the insects" in peace-time economy, the advent of World War II with its emphasis on maximum production, has given it a significance which it probably never had before. When a critical food shortage occurs, one is apt to scrutinize pretty closely possible leakage in our food reservoir. In peace times if one is told that the average annual loss of crops due to the depredations of insects amounts to 10% the reaction is one of complacent concern. Today, however, when John Citizen is counting ration coupons he begins to realize that there is barely enough of many essential foods to go around to feed him, the armed forces

push a desk, we cannot observe the "push" but the result of the push on the desk or ourselves as we apply the force. When two or more elements unite to form a compound, we know that some force exists to hold them because it is necessary to apply chemical force to separate them again. In like manner, two or more like atoms that form the molecules of element are held together by a force which we know exist for we cannot mechanically separate those atoms. Such forces by the results noticed in chemical work, are known as chemical forces.

Forces Between Molecules

It is clear that the forces between molecules must vary over a wide range because some materials are solid, some liquid and some gases at ordinary temperatures. In studying these forces, observations are made that indicate that all molecules are capable of some movement. In solids, the movement is not very great as the body seems to retain its physical shape but it can be shown to exist. In the case of liquids this movement is greater between molecules and exists to the extent that it is necessary to support a liquid on all sides and the bottom which must be joined to the sides at all points. The molecules of a gas show almost unrestricted movement, so much so that the gas must be completely contained to hold it. Further study on the movement of molecules shows that this movement is dependent upon the temperature of the material. The higher the temperature, the more the amount of movement. The increase in movement by rising the temperature of a solid can reach a point where the solid becomes liquid, and for a liquid the increase can be such that the liquid becomes gas. The reverse is also true. The amount of movement can decrease with a lowering of temperature to the point where gas becomes liquid and liquid becomes solid. Thus there is a temperature so low that everything at that temperature is solid. Pressure also has a bearing on the amount of movement of molecules, particularly gases. Increase in pressure decreases the amount or degree of movement while decrease in pressure tends to increase the movement of molecules in gases.

This capacity for movement of molecules, particularly in liquids and gases is very important to the Pest Control Operator. In liquids it enables us to form solutions for sprays, etc. In gases it permits diffusion so that fumigant will permeate the atmosphere in the enclosure fumigated. The fumigant may be handled as a liquid and then due to rise in temperature or lowering of pressure become a gas.

Let's take a look at...

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1944_and After

THERE is no faint possibility that the present year will see the household insecticide industry re-introduced to pyrethrum. Available supplies are urgently needed for mosquito control in combat areas, and one need not have access to the files of the General Staff to predict increasing military activity in some of the worst malarial regions of the world.

It is even more certain, however, that the plantings now being encouraged to meet military requirements will go on flowering profusely after the guns are silent. The long-range view promises adequate and even ample supplies at reasonable costs.

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and our lease-lend associates. Ten per cent is becoming a figure full of meaning and concern is expressed but with the difference that there is a bit of irritation with his demand that "somebody do something about it."

Somebody is doing something not only about this but about many kindred problems vital to the war effort. This somebody is the entomologist, who, equipped with a background of rigorous entomological training, is employing to the best advantage not only his purely entomological knowledge but the pertinent facts of chemistry, physics, bacteriology, agriculture, botany, etc. in combating those insects which in very diverse ways act as powerful behind-the-line agents in hindering our war effort.

One of the most, if not the most important, of these efforts is the maintenance of crop production. As a result of greater and more concentrated crop acreage there is an enormous increase of harmful insects, which if not controlled in time, causes a serious loss. Difficult as the problem is in itself, it is rendered still more difficult by the prevailing loss of man power, shortages of machinery and materials such as insecticides. In addition, at least in the case of the cereal crops, the possible methods of defense against them are strictly limited by the low value of these crops per acre.

To know what methods of attack to employ in any given situation demands first, an accurate identification of the insect and second, a more or less complete knowledge of the life story of the particular species of the insect concerned. The life history of a species is usually characteristic and at some time or place in its post embryonic development a vulnerable point is usually discernable. It is there that the entomologist must concentrate his forces if successful control is to be established. Possible control measures are many and it is the entomologist who must decide which is the proper line of attack in any given case. Among the types of control usually employed may be mentioned, destruction of crop residues, use of barriers, insecticides, hand picking, etc., cultivation, crop rotation and the development of resistant varieties of crops attacked. If, as it seems certain, increased food production will be a vital factor in winning the war, an effective control of injurious insects will result in a greater increase of production than would result from any other single effort.

Closely akin to this problem of increasing the crop yield, is that of guarding the crop after it has been harvested and stored. Losses accruing from insect damage to stored products are not ordinarily looked upon as of great importance by many people. However, when it is realized that in peace time the average annual losses due to insects destructive to stored cereals alone amounts to some $300,000,000 the importance of the work of the entomologist in this field can better be appreciated. The figures for losses of other stored products become still more imposing when one considers items other than cereals, such as legumes, roots, tobacco, spices, hides, tallow, fur, clothing and a host of others.

Our herds and flocks need constant attention to prevent the ravages of their insect enemies. With the value of wool, hides, meats, eggs and milk increasing daily it is imperative that adequate measures be taken that our farm animals suffer no loss of health or productivity. The hordes of fleas, mites, flies, lice, ticks and so-on, require no less vigilance than do the pests of crops.

Another phase of entomological activity in war lies in the use of insects in what is termed biological warfare. It has been said that the Japanese have already attempted to start epidemics of bubonic plague, which is transmitted from rat to rat and from rat to man through the agency of fleas. While this country may never wage war with weapons such as these, it is patent to all forward looking men that measures must be taken to combat any attempt on the part of the enemy to use them against us. Crop pests can be spread over wide areas by means of the airplane and if these pests happen to be of a kind not heretofore found in the region, the results could very well be disastrous. The dropping of human lice better known as "cooties" infected with the pathogens of typhus might well start an epidemic of the disease among our troops unless adequate delousing apparatus or other suitable means is at hand. So could mosquitoes, the vectors of malaria and yellow fever be liberated in areas where the disease has never prevailed.

This brings us to the problem of protecting our shores against the unintentional importation of noxious insects not hitherto found here. As the shipment of troops and war materials, by rail, sea and air, must of necessity, be done expeditiously, great vigilance must be exercised under the supervision of entomologists lest our crops be destroyed by unfamiliar enemies.

The important role which the entomologist plays in the protection of our troops in camp and in the field is acknowledged by almost all people. A world war brings with it the necessity of combating dangerous insects in many different climes. This problem really divides itself in two closely related parts, first the destruction and control of those insects which always appear when great numbers of men are living in close proximity as in camps. The problem really presents no new angles with which the entomologist is not already familiar during peace times, as it involves the eradication of such familiar pests as bedbugs, lice, roaches, fleas, etc. The other part of the problem that of combating insect pests in foreign theaters of war, be it Africa, India, South America or the South Seas, often presents problems which might make even the most stout hearted entomologist wince. One of the most dangerous insect enemies of our troops abroad is the malaria mosquito. To successfully prevent the spread of this disease, at least two steps are necessary, the drainage of all bodies of water which might afford a breeding place for this insect and in those cases where drainage is impractical, the covering of the water surface with an oil film. As our troops are constantly operating in tropical rain forests the problems presented by this type of terrain are gigantic. It is the duty of the Sanitary Corps of the Army to protect troops from most of their insect enemies, and it should be a matter of great gratification to all thoughtful citizens that in spite of their enormously varied sphere of operations, our soldiers in this war have suffered immensely less from insect borne diseases than in any other war.

—Reprinted from Bulletin of Ward's Natural Science Est.

Death to Body Lice and Flies

Powerful New "D. D. T." Is Answer to Long Sought Need

By FRANK CAREY
Associated Press Science Writer

Washington (AP)—The armed forces disclosed recently they have a new and powerful chemical weapon against body lice, the carriers of typhus fever and a dreaded fellow traveler in almost every military campaign in history.

Moreover the anti-louse chemical, in experimental tests, rendered a room destructive to house flies for a period of three months, and proved highly effective against a variety of other pests which

plague man, beast and plant—thus offering wide possibilities for post-war use.

All production of the chemical—called "D. D. T."—now is limited to army and navy uses, except for laboratory experiments.

Army medical department scientists declare the material—used for the first time on a mass scale in the North African campaign—has proved more effective against body lice than any insecticide previously employed. It is used in the form of powder, and a single application to clothing provides anti-louse protection for a month.

Lethal to Flies

Researchers of the agriculture department tried it against flies. They said a single application to the walls rendered a room lethal to flies for three months.

And they reported the material apparently is effective against more different pests than any other insecticide of its particular chemical class. They've employed it successfully against 40 to 50 different pests from Japanese beetles to bedbugs, and from livestock to termites.

The army's medical department put some of its outstanding men to work on the chemical in 1942. Trained personnel of other government organizations and commercial laboratories assisted.

When the true insect killing properties of the material began to unfold, high medical department officials bent every effort to get it into quantity production.

Contains Sedative

A synthetic compound known scientifically by the $10 name of dichloro-diphenyl-trichloroethane, the chemical is prepared from chloral hydrate—a sedative—and mono chlorbenzene, in the presence of sulphuric acid.

The army has devised techniques of applying the new louse powder to underclothing with special hand and power dusters, without necessitating the removal of clothing, as heretofore.

Thus, the military doctors say, it now is possible to apply "mass" protective measures for the armed forces and civilians who might infect the army, with a minimum of equipment and personnel.

It also can be used in a special solution for impregnation of underwear.

Clothing so impregnated will remain free of lice for as long as two months even though it is laundered once a week during that time.

The chemical first was synthesized in 1874 by a German chemist, but it wasn't until 1939 that Geigy, Inc., a Swiss chemical firm, reported on its employment as an effective insecticide against moths and plant lice.

Standard Equipment

The New York subsidiary of Geigy called the attention of the agriculture department to it late in 1942 when the department's bureau of entomology was well under way with a program designed to provide more effective insecticides and insect repellants for military use.

With a supply of "D. D. T." imported by Geigy from Switzerland—none was being manufactured in this country at that time—agricultural scientists investigated. Under the direction of Dr. F. C. Bishop, Dr. W. E. Dove and E. F. Knipling, researches not only demonstrated the utility of "D. D. T." against certain agricultural pests—but found a new use for it against body lice.

In May of 1943, after tests had shown that the material, when used in controlled concentrations, was safe for man, the army rcecommended its procurement as standard equipment, replacing the louse powder then in use.

The old legend of the Pied Piper of Hamelin was tried in Albany, California a few weeks ago when Red Nichols Orchestra leader, attempted to lure the rats into the Bay by parading through the town blowing his golden cornet.

Unfortunately for the town, he failed in his attempt to produce the shrill note necessary to bring forth the rodents.

According to scientists, however, he might have succeeded had he struck just the right note on his cornet. The pests, it seems have an extremely keen sense of hearing and are excited by certain sounds. If Nichols had been able to stimulate the rat-mating call on his cornet, he might have been more successful.

While the self-styled Pied Piper failed to lure the rats, he succeeded better with the children of the town, who followed him dancing in the streets in the best Hamelin town tradition.

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THE DEVELOPMENT OF INSECTS

FATHER OVILA FOURNIER
Institute of Biology, University of Montreal

EDITOR'S NOTE: This paper was read by Father Fournier at the Second Annual Canadian Pest Control Operators Conference February 21, 1944,, was based on an outline provided in the "Conference Manual" used by the PCO's in attendance at the conference.

I. Great Varieties of Insects:

INSECTS are everywhere and their number is immense. We may figure on ten millions species of them—and when we look at the number of individuals of each species we may say that there are two billions of insects for each human being, which makes a lot of insects. Some with wings, some without wings; chewing and sucking, jumping and running, indoors and outdoors, parasites on man, on animals, on fowl, on plants, in stored goods, in grain bins, everywhere, except in salt water, there will be found some kind of insects.

The Growth of Human Children:

Every being, even man, begins by one cell and undergoes different processes of construction in order to become similar to its parents. A man, for instance, from the cradle to the grave, goes through infancy, with a very high rate of growth, and then, at puberty passes to youth. By the age of 21, man is fully grown and is called adult, a stage quite invariable until old age.

In that growth of a human being, I want to stress two main ideas: 1. the embryo during its development is constantly connected with the female and receives from her all the elements required for the construction of tissue, organs and apparatus; in a word, its whole body is built up from substances supplied by the mother. It is a foetal development. 2. After birth, the increase in weight will follow a constant line represented by a regular curve on a graph.

The Growth of Insect Children:

When we deal with insects, the picture is quite different. Here, the individual that emerges from the egg is not at all like the parent who laid the egg. It is a wormlike creature, crawling around in search of food, it eats ravenously and continually. The growing animal, a **larva,** has to rely upon itself to work out its living, fight its natural enemies without any help whatsoever. We have a **larval** development, a type quite opposite to the foetal development we have seen in man. Nature has provided it with an external skeleton that shields its body. The growth will result from the increase in the number of cells, as in any being, but the skeleton will prevent any extension. The young insect is like a boy asking for new shoes, for a new suit, because the ones he uses are too small. Daddy has to buy something larger. It is the same thing with insects. Mother Nature gives a new skeleton, to cover a larger body. When the pressure from inside the body overcomes the resistance of the shield, the latter breaks, splits and is shed off. This important feature in the development of insects is called moulting. Every insect goes through this process many times during its development. At the shedding of the integument, or **ecdysis,** the old suit (termed the exuvia) is discarded and a few hours later, a new cuticula, quite larger than the preceding one will shield a body that has increased its volume while moulting. The growth will not be represented by a regular curve but by an irregular one, looking as a set of steps. Each tread represents the period between two moults; and every riser, the rapid growth during moulting.

If we study a little closer this important feature in insect development we will note that the story is about the following. The insect hides somewhere, ceases to feed. An exceedingly thin membrane is formed between the body cells and the cuticle. At the same time a liquid is produced that dissolves the inner portion of the skeleton. The insect swallows some air in order to increase the pressure on the garment that splits along some line of weakness. The insect comes out from its old covering, colorless, swallows more air and expands rapidly. Exposed to the air, the new cuticle stiffens, acquires new colors and begins to do the chores of its daily life. The moult is over. A series of these moults will lead to the adult stage.

Terms Used:

Any insect passes through different changes to reach the adult stage. All these changes are called **immature stages.** The form assumed by an insect between two moults is named **instar,** in some cases; **larva** in other ones. The shedding of the cuticula is the ecdysis or moult.

Incomplete and Complete Metamorphosis:

Let us set away these general datas and take two examples.

The Cockroach: A baby roach emerges from the egg in a form quite similar to that of the parents except for its size and the absence of wings. After the first moult will come the second instar, which is quite larger. And thus, little by little, the young insect will get closer and closer to the adult. After a given moult (let us suppose the third one), wingpads can be seen. This instar bears a special name, the roach has become a nymph. The last moult will give an adult with mature reproductive organs. We have the **imago.**

In cockroaches, the immature stages **gradually** change into stages which resemble more and more to the parent. This type is called direct metamorphosis or incomplete metmorphosis. All the lower orders of insects have a growth of that type.

The House Fly: If we take now the case of a house fly, we notice that from the egg emerges a wormlike creature, a maggot, entirely different from the parent, called **larva.** "The term was suggested by a belief of the ancients that the form of the perfect insect was masked, the Latin word larva meaning a mask" (Comstock). Examples of these larvae are caterpillars that develop into butterflies and moths, maggots that give flies, grubs that will become beetles and so forth.

The larva passes through many moults, as the cockroach, but one stage is particular to this type, the pupation, during which the larva is called pupal larva or **pupa.** Pupa means a doll or a little girl on account of its resemblance to a bound up doll or baby, like the pappoose or Indian baby. This stage is a period of apparent rest lasting sometimes many months, but only a few days in the house fly life-history. I said that the rest was **ap-**

parent. And it is quite true since very wonderful changes take place during this period. **The wings** that have developed within the body come outside so that they may expand and be used at the emergence of the imago. **The legs** develop primarily in a cavity with their different segments telescoped together.

The mouth-parts, the antennae, and in a word, nearly all the different parts of the pupa are transformed. After this **pupal rest** which truly is the most active immature stages, the adult or imago will emerge giving the house fly that you all know. This type of development is characterized by a resting stage, the pupation during which the larva is transformed. It is called complete metamorphosis.

This sketch of insects development is sufficient, I imagine, to point out the type of development called **"larval type."** A question arising naturally is what are the factors controlling so many and so complex changes necessary for the growth of an insect?

(a) Moulting is initiated by a substance called a hormone, produced by a little gland of the nervous system.

(b) The pupation is a specialized moult controlled by a special hormone, different from the one which causes moulting.

Rat-Catching As a Profession

By J. D.

Among the many occupations about which I should hesitate long and earnestly before adopting, that of a rat-catcher—I beg pardon, rodent foreman—ranks highest.

Yesterday I went to the demonstration room in the Standard Arcade to see how the Health Department's collection of rats was coming along. The official in charge gave me such an enthusiastic welcome that, for a moment, I had the uneasy notion that he thought he was being introduced to a new specimen.

Not that he needs any more, for during the tour of inspection on which he conducted me I saw white-booted rats, white rats with pink tails and eyes, striped mice, Scotch mice, large-eared mice, a snake weavel, which is a sort of hybrid off-shoot of a mongoose and a red meerkat, a nest of gerbille, and, believe it if you can, a six-legged rat.

There were also two mice that squeaked like canaries when touched.

BAITING TRAPS

While we walked round the room I made a few inquiries about the business of catching rats. From all accounts the rats are pretty particular when it comes to supplying them with food. "The best or nothing" appears to be their motto, for unless you are prepared to bait your traps with good quality cheese, a rasher or two of streaky bacon, well-cooked porridge, or bread soaked in milk you are merely wasting your time. To say nothing of the rats' time.

Moreover, they don't want the same menu night after night. Oh, dear me, no. It has to be varied with cooked meat or fish or any other foodstuff that does not happen to be in the household larder at the moment. And that, if I may say so, seems to me to be superlative cheek, when you consider the social standing of the average rat.

Of course, all this feeding merely leads up to where Mister Rat runs into a pile of grief, for, on about the sixth night of the party, you drop a small handful of white arsenic into the food, which puts all your guests on their backs for the count.

BEST WAY

By far the best way of dealing with rats is the ——— process, which I saw demonstrated yesterday afternoon. Calcium cyanide in powder form is forced into the rat-run by means of a special pump. The victim used for my benefit was as plump and agile a rat as ever I've seen. The demonstrator popped him into a glass walled box, gave the pump three depressions, and in less than 30 seconds the rat was where all of them should be.

—Rand Daily Mail, Johannesburg, South Africa.

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The Division of Entomology and The Pest Control Operator*

By C. R. TWINN, *Ottawa, Ont.*

EDITOR'S NOTE: Dr. Twinn, Associate Entomologist, Division of Entomology, Canadian Department of Agriculture, presented the following paper at the Canadian PCO Conference in Montreal, February 21, 1944.

I AM very pleased to have the opportunity of attending the second annual meeting of the Canadian Pest Control Operators' Association and to know that the organization continues in an active and flourishing condition under the capable direction of your executive officers. I wish to convey to you the greetings and wishes for your continued success from Mr. H. G. Crawford, who was recently appointed to the position of Dominion Entomologist, made vacant by the death of Dr. L. S. McLaine last July.

The insect problems of the pest control industry are numerous and increasing in severity and importance in many localities, as a result of wartime conditions such as local congestion of population and inadequate housing facilities. Needless to say, the PCOs are in a position to do work of real national importance in ameliorating the pest situation. As I understand it, one of the major purposes of this conference is to help the pest control industry to increase their contribution to the national well-being.

The officers of the Division of Entomology are anxious to assist the PCOs in solving their insect problems and in finding suitable substitutes for insecticides no longer available or difficult to obtain because of war conditions, or because of other reasons, and in improving existing formulae and methods of application. The desire is especially to help the industry as a whole, and therefore, the Division strongly supports the suggestion that PCOs having problems to solve should send them to the secretary of the organization for transmission through him to the Dominion Entomologist. Then the answers to the inquiries, after being made known to the PCO immediately concerned, could, if of general interest, be made available to all members of the Association through the medium of the periodical service letters. PCOs should also bear in mind that the Division of Entomology is equipped and prepared to identify any insect specimens that they may forward to Ottawa for determination.

In order that there shall be no misunderstanding it should be pointed out that owing to pressure for such services the bulk of the Division's appropriation is devoted to solving insect problems affecting field, garden and fruit crops, and the forest, and comparatively little is at present available for research on household insects. The organized pest control industry can force development of research in this field by making use of existing services and by increasing their demands for information and technical advice.

With a view to self-help, it is suggested that the organization might give consideration to the possibility of providing funds with which to establish a fellowship at one or other of the universities or colleges under which a promising student could be selected to carry on research work on some problem or problems of special interest to the pest control industry, under the direction of a competent entomologist or zoologist.

As it is possible that many of you are not conversant with the organization and activities of the Division of Entomology, I feel that it might be advantageous to give a brief outline of them. The Division is a section of the Science Service, of the Department of Agriculture, to which belongs the Division of Plant Protection, whose activities are also of interest to the PCO. The work of the Division of Entomology is taken care of under the direction of several units. The administration unit and the headquarters of the other units are situated in the Confederation Building at Ottawa. Such projects as the Canadian Insect Pest Survey and household insect investigations are included under administration. At Ottawa, too, is the Systematic unit which is engaged in problems of insect taxonomy and classification and has charge of the National Collection of Insects. The stored products insects unit maintain a laboratory in Ottawa and deal with pests of grain and other stored foodstuffs and commodities.

The field crop insects investigations unit carry on studies at laboratories situated in Prince Edward Island, New Brunswick, Quebec, Ontario, each of the three Prairie Provinces and British Columbia. In the West their major problems deal with such pests as the wheat stem sawfly, grasshoppers, wireworms, cutworms, and a number of other insects affecting chiefly the grain crops in the prairies. The importance of some of these species is demonstrated by the fact that the wheat stem sawfly alone caused an estimated loss of fifty million bushels of wheat in Saskatchewan and Alberta in 1941. Elsewhere in Canada this unit deals with such insect pests as white grubs, flea beetles, potato beetles, corn borer, root maggots, and other pests of field and garden crops.

The fruit insects unit, with laboratories in the principal fruit districts of Nova Scotia, southern Quebec, southern Ontario and British Columbia deals with pests such as the codling moth, apple maggot, aphids, leaf rollers, budmoths, mites, oriental fruit moth, and a variety of other destructive insects. Fruit growers concede generally that if effective control measures based on research by entomologists and plant pathologists were not available their industry could not have been built up and maintained. Studies of greenhouse insects are carried out in the laboratory at Vineland Station, Ont.

The forest insects unit has laboratories in New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan and British Columbia. The officers of this unit are studying a number of extremely widespread and destructive insects such as the spruce budworm, spruce sawfly, larch sawfly, bronzed birch borer, bark-beetles, tent caterpillars, etc. One of their present major projects is a Dominion-wide survey of forest insects to obtain data on which to formulate methods of improved forest management to reduce the insect menace and to facilitate the operation of natural control.

Additional Patents Relating to Pest Control

By DR. R. C. ROARK.

2,331,681 (October 12, 1943; appl. March 22, 1941). PREPARATION OF CHLOROACETONITRILE. Ingenuin Hechenbleikner, Stamford, Conn.—American Cyanamid Company, New York, N. Y.—A method of making chloroacetonitrile comprises treating glycolonitrile in the presence of an organic base with an acid chloride chosen from the group consisting of thionyl chloride, phosphorus trichloride, phosphorus pentachloride, and phosphorous exychloride and recovering the chloroacetonitrile from the reaction product. Chloroacetonitrile has been found to have interesting properties as a fumigant for various species of insects.

2,334,586 (Nov. 16, 1943; appl. October 20, 1942). WOOD-PRESERVING APPARATUS. Grant B. Shipley, Pittsburgh, Pa.

2,335,323 (Nov. 30, 1943; appl. March 3, 1942). PEST CONTROL. Wendell H. Tisdale, Wilmington, Del.—E. I. du Pont de Nemours & Company, Wilmington, Del.—A method of conditioning soil infected with nematodes comprises incorporating in the soil a compound selected from the class consisting of 1-phenyl-2-nitroethylene and 1-alpha-furyl-2-nitroethylene in an amount sufficent to devitalize the nematodes.

2,331,682 (October 12, 1943; appl. February 11, 1942). MANUFACTURE OF CHLOROACETONITRILE. Ingenuin Hechenbleikner, Stamford, Conn.—American Cyanamid Company, New York, N. Y.—A method of producing chloroacetonitrile includes the steps of reacting glycinonitrile hydrochloride with nitrosyl chloride and recovering the chloroacetonitrile from the reaction product.

2,332,097. (October 19, 1943; appl. September 18, 1942). INSECTICIDE. Edward R. McGovran, Hyattsville, Md. Patentee claims an insecticide containing methyl phenyl nitrosoamine and pyrethrum extract also an insecticide containing 2,4-diamylcyclohexanol and pyrethrum extract.

2,332,334 (October 19, 1943; appl. October 3, 1941). ANIMAL TRAP. George H. Morrison, Fruitport, Mich.

2,332,960 (October 26, 1943; appl. June 6, 1941. In Great Britain June 21, 1940). INSECTICIDE. Edward Sydney Redvers Willmore, Watford, and Francis Ashmole Cooper, Berkhamsted, England—Cooper McDougall & Robertson Limited, Berkhamsted, England—The patentees claim an insecticide consisting of a powdered mixture comprising finely divided sulphur and an aluminum derivative of cresylic acid which, when suspended in water, hydrolysese to give a solution of cresylic acid.

Another important unit deals with biological control and has a splendidly equipped parasite laboratory at Belleville, Ontario, for propagating imported and other parasites and predators for liberation as an aid in the natural control of a number of major pests, especially those of foreign origin.

At Kamloops, B. C., is maintained a laboratory where are centered studies of insect and allied pests which attack livestock and other wild and domestic animals and birds.

The PCOs may be assured of helpful advice and cooperation from the officers of the various units of the Division stationed at the laboratories throughout the Dominion. The location of these laboratories is given on the inside cover of the household insect bulletin (Department of Agriculture Pub. No. 642, available from the King's Printer, Ottawa, at 25c per copy) and of other bulletins of the Division.

In conclusion, I would like to remind members of the Association that the Division of Entomology has library and other facilities for keeping in touch with progress and developments of interest to the PCO throughout the world, and is pleased to help the industry with technical advice as opportunity presents or whenever called upon to do so, and will continue to maintain a lively interest in the problems and activities of the Pest Control Operators' Association.

*Contribution No. 2298, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

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WHAT'S NEW IN PEST CONTROL-PERSONALS

N.A.I.D.M. MEETS JUNE 12-13: The 30th annual mid-year meeting of the National Association of Insecticide & Disinfectant Manufacturers will be held at the Edgewater Beach Hotel, Chicago, on June 12 and 13.

THE THORO EXTERMINATING CO. of New York, has moved to their new and larger quarters, 1 West 125 St., N. Y. C. They are continuing their PCO service as well as carrying a full line of PCO and Sanitary Supplies for the trade.

AIR-CORPS CORPORALS Samuel and Sidney Piller, members of the firm of Elkay Products Co., N. Y., send their greetings to the trade. The former is stationed at Bergstrom Field, Austin, Texas; while the latter is at Clovis, N. M., having previously seen action on Attu Island.

PRENTISS ADVANCED TO MAJOR

Major Richard J. Prentiss, Sanitary Division Medical Corps, has been promoted to a Majority from the rank of Captain.

Major Prentiss is on leave of absence as President of R. J. Prentiss & Co., Inc., importers of Crude Drugs, Chemicals, and Insecticides.

Major Prentiss, at present, is stationed in Washington, D. C., attached to the office of the Surgeon General, U. S. Army.

BELL EXTERMINATING CO., Inc., announces the removal of their office, laboratory and stockrooms as of February 1, 1944, to 20 Hudson Street, New York 13, N. Y.

CREDIT FOR THE YARN which follows goes to Mrs. George B. Lay, wife of the District Agent, U.S.D.I., Fish & Wildlife Service, Division and Rodent Control, who is located at Boston, Mass. Incidentally, the Lays make their home in Hopkinton, Mass.

It seems that a business man from Hopkinton, Mass., immigrated to the town of Selma, North Carolina and went in business. As a business man he did well. Being single, he lived in the local hotel. The only trouble with this chap was, viewed from the standpoint of Selma's citizens, that he always bragged on Hopkinton. Nothing in Selma was as big or as good as the same thing in Hopkinton. The hotel manager and other guests, and even the colored porter and colored maids in the hotel, got fed up.

Finally, one night someone slipped a large box turtle in his bed just before he retired. Everyone in the hotel was all set, so, when he came dashing down the stairs in his pajamas, yelling and screaming, they all knew that the trick had worked. He explained in loud tones and very excitedly that there was some kind of a strange animal in his bed. The local spectators said "tish, tish", but everybody went up to his room. The manager of the hotel dramatically pulled the bedclothing back and disclosed the turtle. He turned to the Hopkintonian and said: "Is this (and he pointed to the turtle) what you are talking about?"

"That's it," the chap replied.

"Well, my friend, I can tell you what the thing is. It is nothing in the world but a small Selma bedbug. Now, can you beat that in Hopkinton?"

THE FBI's FAME as rat catchers has long been celebrated in song, story and headline, but the famed J. Edgar Hoover boys really had their mettle tested when they were called in recently to explain the destruction of cables in the public address system at a west coast shipyard. The room in which the cables were damaged contained a lot of valuable blueprints, and the case looked serious until it was discovered that the saboteur who enjoyed cutting the insulation of the cables was a large gray wharf rat. The G-men set a trap and got their public enemy, just as you'd suspect.

PYRETHRUM IN CHILE — Pyrethrum plantings in Chile amount to approximately 40 acres at the present time, says a consular report to the Department of Commerce. The 1942 output of pyrethrum powder is reported as 40,000 kg. Considerable quantities were sent to Argentina and some to Cuba, while small shipments were made to a number of other countries.

It is hoped to produce 200,000 kg. of pyrethrum from the increased 1943-44 harvest, to be available for shipment in April 1944. The entire output will be purchased by the Commodity Credit Corp.

—Chem. and Eng. News.

CAPT. ROBERT R. HEATON, Lafayette, Ind., P.C.O., is now in Italy and the louse and typhus are his major problems. His address: 15th Med. Gen. Lab., A.P.O. No. 570, c/o Postmaster, New York, N. Y.

LT. CHARLES O. PARTLOW, former Lafayette, Ind., PCO, has been transferred to Randolph Field, Texas.

1st LT. CHARLES DENNY, Sn.C., is currently on duty at the Station Hospital, Camp Wolters, Texas. Charlie, as if you didn't know, hails from St. Louis. Needless to say he was missed at the St. Louis NPCA Meeting.

CAPT. W. E. McCAULEY, whose wartime activities have been commented on from time to time in these columns, is now with a laboratory and has been assigned to the U. S. Typhus Commission. Mac indicates he will have a great deal to report when he returns which will be of great interest to those interested in pest control. His address: 0307800, 3rd Med. Lab. Base B, A.P.O. 503, c/o Postmaster, San Francisco, Calif.

RICHARD J. PRENTISS, of R. J. Prentiss & Co., N. Y., has been promoted from a Captain to a Major in the Sanitary Division, Medical Corps, attached to the Office of the Surgeon General, U.S.A., Washington, D. C.

ENSIGN W. K. DELAPLANE, JR., on leave of absence from the Illinois Pest Control Co., Urbana, Ill., is now with the U.S.N.R. Malariology Unit No. 73, c/o Commander 7th Fleet, c/o F.P.O., San Francisco, Calif. Latest word from Bill indicates he is on his way to the S. W. Pacific. While in S. F. he had a very enjoyable visit with V. H. Montgomery, prominent pest control operator on the West Coast.

A reliable firm desires an experienced PCO who can manage a Branch Office. Good opportunity for the right man. Write full qualifications, past experience and salary desired. This firm is on the West Coast. Box 38, Pests.

J. L. HOPKINS BUYS BONDS

Exemplifying the theme of his company's advertising in the trade press, urging the purchase of war bonds, J. L. Hopkins, head of J. L. Hopkins & Co., importer, exporter and miller of crude drugs, has personally purchased $50,000 war bonds in the fourth war loan drive. The Hopkins company advertising has been featuring an excerpt from the sayings of Abraham Lincoln: ". . . with firmness in the right as God gives us to see the right . . . let us strive on to finish the work we are in. . . ."

ARMAND C. PARTLOW. — Armand C. Partlow, 7, son of First Lieut. and Mrs. Charles O. Partlow, died Wednesday at his home, 1200 Morton street. Born in St. Louis, he had been ill since Christmas. His mother is the former Gertrude Vanderwall. His father now stationed at Randolph field, Texas, is owner of the Reliable Exterminating company of this city. The boy was enrolled in the Sunday school and was a baptized member of the First Reformed church. Besides his parents, he leaves his grandparents, Mr. and Mrs. John J. Vanderwall, this city.

MAINTAINING YOUNG TED'S mealtime schedule at the Buettner home, while his parents, Helen and Bill attended the recent Canadian Pest Control Operators Conference, were Tom Mahon, assistant secretary of NPCA, his lovely wife, and Billy, Jr. While all this was going on, "Buff"—that's the Buettner pooch—entertained his favorite pin-up girl, "Lady", a pooch belonging to the Mahons.

MR. AND MRS. WALTER McCLOUD of Chicago came on to New York for a visit during February, after attending the Canadian Pest Control Operators Conference at Montreal.

MRS. MARY PALLIS HOFFMAN, WOB's secretary, is spending the month of March in Texas, visiting her husband, Everett, an Aviation Machinist Mate, First Class, stationed at the U. S. Naval Air Station, Corpus Christi.

IN HOLLYWOOD, FLORIDA, during February: Mr. and Mrs. L. L. Crosby, of the Commonwealth Sanitation Co., Pittsburgh, Pa.

CORRECTION

The heading "PCO Snapshots from the Purdue Conference", p. 25, February, 1944, Pests, should have correctly read: "PCO Snapshots of the Eastern Pest Control Operators Conference."

Retiring from his office as first president of the Canadian Pest Control Association, an office in which he set a noteworthy record of accomplishment, W. S. Bomby, head of Ocean Chemicals Ltd., Toronto, is proceeding to Bermuda to assist and advise the Public Health Department in conducting an anti-rat campaign, it was announced recently by Bermuda's Colonial Secretary.

DDT SUPPLY TO BE STEPPED UP: DDT, current production of which has been taken over by the military, may be available for civilian use in about three months or so. The WPB has approved four plant-expansion projects; namely Merck, Hercules, du Pont and Cincinnati Chemical and it is expected they will be in operation around June. When these plants are in full operation it is anticipated that the military needs will be met and a surplus made available for allocation to the civilian.

RATS ALONE destroy as much food each year as more than 200,000 farmers can produce.

WARNS OF DANGER FROM FOREIGN PACKAGES—Discovery of insect pests—possible carriers of infectious diseases—in Christmas parcels shipped home by members of the armed forces serving overseas has led to a warning from the United States Department of Agriculture that wrappings of all such packages should be removed and burned as soon as they are received, the Army and Navy Journal reports. "If allowed to escape, the insects and insect eggs stored away in this packing may cause new flare-ups of pests such as the Mediterranean fruit fly, which has been wiped out in continental United States at a cost of millions of dollars," the department's warning stated.

Service men abroad have been given detailed instructions for packaging gifts to be sent home and warned against using foreign filling materials which might contain insects, but, the department points out, "A man packing a gift with one hand while keeping a rifle ready for the enemy with the other has little time to read instructions."

WISCONSIN COLLEGE OF AGRICULTURE experimenters have found sabadilla seed ("green lily" or "feather-shank" in the Southwestern States) is erratic when used alone on insects.

TWO PARTS SODIUM FLUOSILICATE, one part phenothiazine and one part white flour gave complete control of both chewing and sucking cattle lice in experiments at North Dakota Agricultural Experiment Station.

BATS—Certain members of the bat family can live for months without food.

Bats absorb training with surprising aptitude. In two days they can be tamed sufficiently to eat from your hand and to appreciate having their backs scratched.

Bats should not be destroyed—rather encouraged. They prevent damage to rafters and other woodwork by devouring the beetles and grubs that bore into them.

Bats are mammals—they suckle their young at their breast.

They wash themselves with their togues and use their wrists to dry their faces.

HAITI JOINS DERRIS GROWING PROGRAM: One hundred thousand cuttings of derris from the U. S. Department of Agriculture experiment station at Mayaquez, Porto Rico, have been planted in Haiti as part of the effort to expand Latin-American rotenone production, reports the AIF News.

Under an agreement between Haiti and the Commodity Credit Corporation, the United States will get the entire production from the rotenone-bearing derris roots. The cuttings have been parceled out among small farmers.

Adding other Latin-American nations, the announced goal is to have 1,500,000 such cuttings planted by next spring in Central America and Mexico. (Two to three years are required for growth to the harvesting stage.)

RAT PLAGUE BEGUN IN BRITAIN BY AIR RAIDS

"Continued bombings by the Germans have brought forth countless hordes of rats from their burroughs and hiding places and have created a menace to the people of Great Britain. Diseases carried by rats are now spreading and the enormous amount of vital food supplies being destroyed by them are problems that demand the attention of both the Armies and civilians. The estimated annual damage done by the rat in Great Britain is over 25,000,000£ (@ $120,000,000)" states one of our American soldiers (former pest control operator) in a recent communication.

—*PCO News.*

TYPHUS EPIDEMIC IN NAPLES

As the result of an outbreak of typhus, Naples has been closed to 5th Army troops except for units based here, and Allied authorities are taking steps to protect the city's 1,000,000 or more civilians.

Two hundred and fifty civilians have been stricken, but not one soldier has yet become ill. Mortality has been about 25 per cent of reported cases.

Overcrowding, wrecking by the enemy of water mains and sewerage systems, and confiscation of medical supplies helped to bring on the epidemic.

WOOFS TO THE RESCUE — Greatest health menace at the key U. S. military base of Dutch Harbor in the Aleutians is a swarming, half-million-odd rat population that has battened for years past in the mean, garbage-strewn alleys of Unalaska village.

Army and Navy authorities have gone after the rats with traps, poison and sanitation control in the village. In addition, hunters have been forbidden to shoot such valued rat killers as hawks, eagles, owls and foxes. As a final touch, the Army called up part of its K-9 Corps, ordered a dozen specially trained terriers from the States. The Aleutian, official servicemen's publication, announced: "The WOOFS are coming." For the first time in Dutch Harbor's history, the rats were definitely on the run.

WPB MAY CHANGE L-41 TO EASE REPAIR WORK

The War Production Board is considering the feasibility of relaxing Order L-41, the basic regulation under which civilian construction projects are forbidden unless certified as essential to the war effort, some officials of the agency reported yesterday.

Among the proposed changes, it was pointed out, is one revising the definition of maintenance and repair work as now used in the order by substituting the word "customary" for "necessary."

The effect of such a change would be to permit property owners to carry out limited amounts of alteration work at the times they ordinarily would do so, and not force them to wait until such repairs were critically needed.

The mouse population in Massachusetts orchards varies from 80 to 100 to the acre.

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GUARANTEED TO OUTWEAR AND OUTLAST ANY OTHER HOSE OR MONEY REFUNDED

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WIZO RAT GLUE BOARDS

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A practical and economical way to rid buildings of rodent pests! No hazards of poisoned bait . . . or of decomposition! Easy to prepare! Just place WIZO Rat Boards near rat hole or form a runway next to walls. Fasten boards to floor to prevent pulling away. Rodents are caught firmly the moment they step on the boards.

WIZO RAT GLUE can be obtained in quantities for preparing your own boards. Write for complete particulars.

ELKAY PRODUCTS CO.
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LOCAL ORGANIZATION NEWS

Greater Pittsburgh Pest Control Association

At the regular annual meeting of the Greater Pittsburgh Pest Control Association held at the Hotel William Penn, election of officers took place.

G. E. Cooper of the Marvella Keyspray Sales & Service Company was elected President. Louis Gatto of Beaver Falls was elected Secretary, and A. H. Helfgott of the Remo Sanitation Extermination Company was elected Treasurer.

The pest control operators of Pittsburgh are continuing their contacts with the Health Officials to the end that a rodent control program on a year round basis may become the basis of meeting such problem.

Indiana State PCOs Meet

The Indiana State Pest Control Operators' Association met Tuesday evening, January 18, in the Union Building at Lafayette, Indiana. Due to difficulties in traveling to meetings because of gasoline rationing, it was decided to discontinue regular bimonthly meetings and to retain the present officers during the present crisis. However, it was decided to keep the association active by correspondence until restrictions permitted better travel accommodations and to maintain relations with the Annual Conference and Annual NPCA meetings.

Those attending included Bert Lewis, President; Maurice Bailie, J. R. Franklin, A. D. Bosley, H. B. Jordan, L. C. Baxter, George Spellios, K. F. Hannum, and George Hunter.

Baltimore Pest Control Operators Meet February 3rd

A dinner meeting of the Baltimore, Maryland pest control operators took place at Dubner's Restaurant on Thursday, February 3rd. Walter Porter of the Rose Exterminator Co. presided. The guest speakers were Dr. Ferdinand A. Korff, Director, Bureau of Food Control, Baltimore City Health Department and William O. Buettner, Secretary of the National Pest Control Association.

Dr. Korff reviewed unsanitary conditions that existed in some of the 10,000 food handling establishments of Baltimore and the need of pest control services. Dr. Korff constructively pointed out the necessity of careful service work owing to the chemicals that must be used and stressed more attention being given to rat control. More cooperation could be given by pest control operators to insist on sanitary conditions being done by property owners and tenants and pledged his co-operation to the pest control operators if proprietors gave no attention to cleaning up rat harborages and having essential rat proofing done.

Mr. Buettner conducted an open forum of questions and answers dealing mainly with industry problems and how the industry can be expected to perform services based on alternate and substitute chemicals and curtailed equipment requirements. Manpower in Baltimore like most places was the Number One problem that was discussed from all angles including consideration for draft deferments.

Among those in attendance were:
F. D. Hubbell, Baltimore Fumigators, Inc.
Martin T. Meyer, Theo. Meyer, Est.
W. H. Grahn, Theo. Meyer, Est.
Walter Porter, Rose Exterminator Co.
J. E. Toolet, Rose Exterminator Co.
S. W. Harrington, Rose Exterminator Co.
H. B. Grimes, Rose Exterminator Co.
Vernon A. Porter, Rose Exterminator Co.
Gilbert M. Stover, B. & B. Exterminators, Inc.
V. A. Potter, B. & B. Exterminators, Inc.
Kenneth F. Owens, B. & B. Exterminators, Inc.
Charles Murray, B. & B. Exterminators, Inc.
G. J. Radwitch (Individual Operator)
J. R. Giese, J. R. Giese Exterminator
J. A. Jett, Vogel-Ritt, Inc.
R. C. Cote, Vogel-Ritt, Inc.
Dr. Ferdinand A. Korff, Baltimore City Health Department
William O. Buettner, Secretary, National Pest Control Association

New Jersey Pest Control Association

At the last regular meeting of the Association, a new board of officers was elected as follows:

President — Frederick Bowers, Rahway, N. J.

Vice-President — Walter Roberts, Cliffside Park, N. J.

Treasurer—Harold Krauss, Newark, N. J.

Secretary — D. P. McAlindin, Hoboken, N. J.

The last meeting was scheduled for March 2nd, 1944 and Major Edward W. Zukauckes, M.C., Post Medical Inspector, Fort Dix, N. J. was the principal speaker. His subject was "The Military View on Pests and Diseases".

Pest Control Operators of Greater Kansas City

A special meeting was held on February 4, to elect officers for 1944.

The following members elected to office were:

Ned R. Pulley, President; F. R. Andrews, Secretary and Treasurer.

Members attending the meeting were:

Ned R. Pulley, National Exterminating Company.

F. R. Andrews, Andrews Exterminating Company.

A. L. Linck, Paramount Fumigating Co.

J. S. Mathias, Gates Exterminating Co.

Thomas C. Raley, Getz Exterminators, Inc.

R. Shuyler, Termite Exterminating Co.

Another meeting is being held on March 1.

THAT RAT HITLER AGAIN

Long Beach, Calif.—A rat put a busy outfiting dock out of operation temporarily at the Consolidated Shipbuilding Corp. yards early today.

All lights and power aboard ships being completed at the dock were cut off for an hour when a rat—employes promptly dubbed him "Hitler"—bit through an electric cable, short-circuiting a transformer.

The bite also short-circuited "Hitler." He was electrocuted.

Aggressive, reputable firm, needs 2 experienced Salesmen for New York City and Conn. Opportunity Branch Manager. Write full qualifications, past experience and salary desired. Box 555—Pests.

The Action of Bean Leaves Against the Bedbug

By HENRY H. RICHARDSON,[1] *U. S. D. A., Agr. Res. Adm., Bureau of Entomology and Plant Quarantine*

IT IS the practice in the Balkan countries to exterminate bedbugs (**Cimex lectularius** L.) by spreading common bean leaves on the floor of infested rooms. According to Bogdandy (1927), the bedbugs crawl onto the leaves at night, and the next morning the leaves with the bugs on them are removed and burned. He states that the bugs sometimes completely cover the leaves, and that in a badly infested room he has removed 2.25 pounds of them. The bedbugs appeared to be in a dazed condition for they reacted very sluggishly upon mechanical stimulation and could hardly be induced to move from the leaves.

From this report the question naturally arises: Is there a chemical present in bean leaves which attracts and possibly dazes the bedbug? If so, it might be useful against this insect, the control of which is especially important in wartime since infestations are liable to develop in soldiers' barracks, air-raid shelters, and similar places. The action of bean leaves on the bedbug was therefore studied prior to a possible investigation of the attractant chemical, if any, was found.

After preliminary studies a series of 7 tests were made, in which 24 to 273 bedbugs (average 110) were confined in an enameled pan 9 inches in diameter on

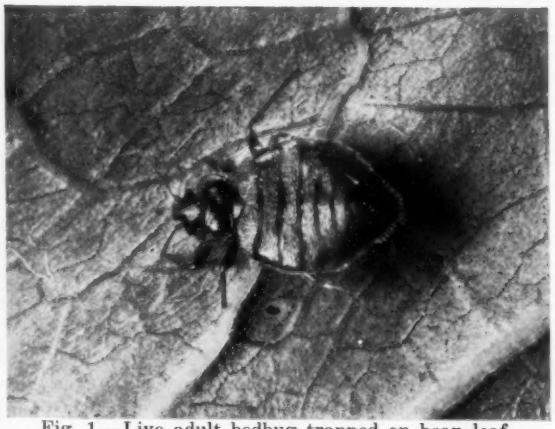

Fig. 1.—Live adult bedbug trapped on bean leaf. Note abnormal position of legs. X10.

which were spread 3 or 4 freshly picked bean leaves, **Phaseolus vulgaris** L. and an equal number of squares of white blotting paper of the same area as the leaves. Blotting paper is regularly used in rearing bedbugs (Woodbury et al. 1939, Campbell et al. 1941), and once placed on it the insect rarely leaves except to feed. The pan was covered loosely with a similar pan to keep out light, and the insects were allowed to remain overnight. Upon examination the next morning on an average 32 per cent of the bedbugs (ranging from 12 to 62 per cent)

[1] The writer is indebted to H. L. Haller for calling attention to Bogdandy's report, to J. G. Pratt for making the photographs, to Carlo Zeimet for helping with the translations, and to S. F. Blake for suggesting types of plants.

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were found on the bean leaves; the remainder had gathered on the under side of the blotting paper. Other types of foliage were also tested, but they gave negative results.

This rough test at first seemed to indicate that bean leaves might have some attractant powers, but on closer observation it appeared that the bedbugs were trapped in some way on the leaf. Figure 1 shows that the legs of the bedbug caught on the leaf are stretched out in an abnormal position. Most bedbugs at rest tuck the lower parts (tibia, tarsi, and claws) of the second and third pairs of legs under or alongsides the abdomen. Under higher magnification, as shown in figure 2, the bean

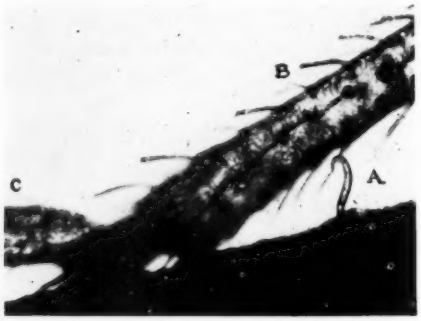

Fig. 2.—A, Hooked hair present on bean leaf; B, tibia of bedbug leg; C, tarsal segments of bedbug leg. X200.

leaves were found to have small hairs, with a sharply pointed hook at the distal end, on both the upper and the lower surface of the leaves. Usually the tarsal segments or the claws of the insect's leg are caught by the hooks, and in some cases the sharp point of the hook appeared to be embedded in the outer covering (cuticle). The hooks are strong, and when a leg is caught the insect usually struggles vigorously so that other legs become entangled.

Bogdandy states that the bean leaves should be placed with the under side up. In the present tests the majority of the insects were caught on the under surface, and examination revealed more hooked hairs on this side.

Apparently the bedbug walks up onto the bean leaf simply by chance and walks off it just as casually unless a leg becomes entangled in the hooks. There appears to be no attractant action.

The fact that some bedbugs remained on the exposed surface of the leaf, rather than hidden underneath, where they would normally be found, is another indication of a restraining, trapping effect. Kemper (1936) stated that Bogdandy was mistaken in his observation that bean leaves have an attractive action. Kemper believed that the presence of numerous bedbugs on bean leaves may be explained simply by their habit of seeking a protected place. However, the present results do not support that explanation, since the bedbug would normally seek protection on an unexposed surface.

This trapping action will also explain, but not support, Bogdandy's statement that the insect appeared dazed and could hardly be induced to move. According to further observations, the insect, once caught, rarely frees itself, except by molting, and the cast skin remains caught in the hooks. There seemed to be no dazing effect, for after being freed of the hooks, the insects moved off rapidly and appeared quite normal. The fact that trapped insects remained alive for some time and finally starved to death also indicates the absence of any toxic effect.

Once several insects were caught on a leaf, others came and rested among those that were trapped. This was apparently due to the herding, or grouping, habit of the bedbug.

Only two varieties of bean leaves were tested, Early Bountiful variety of bush beans and an undetermined variety of kidney beans. In future tests it may be desirable to try a wide selection for possible differences in efficiency.

Tests were also made with a number of other types of plant foliage, including alfalfa, coleus, chrysanthemum, fuchsia, and white clover, but the results were negative. None of these plants had the hooked hairs.[2]

Tests were also made with the seed pod of the common weed tick trefoil, or beggar's-lice (**Desmodium** sp.), which is covered with small hooked appendages similar to but larger than those on bean foliage. The bedbug can also be trapped on the hooks of this plant (Fig. 3).

The practicability of the use of bean leaves in bedbug control has not been tested. Bogdandy states that all the bedbugs were destroyed after three or four renewals of the bean leaves. It seems probable that large populations of bedbugs can be greatly reduced in this way, and the method may be worth a trial where no suitable insecticides are available. However, there would be no effect on the eggs, and complete extermination by this method seems very questionable.

Summary.—To find out why bean leaves are used in the Balkan countries for trapping bedbugs (**Cimex lectularius** L.), bedbugs were confined with bean leaves

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The Bureau of Entomology and Plant Quarantine and Wartime Pest Control

(Continued from page 9)

important to remember that their service and performance are not backed by the long time experience of the materials which they may replace. Don't forget that they have some irritating and perhaps other unsatisfactory qualities, and that the lasting and knock-down effects of them may differ.

One of your most useful insecticides, pyrethrum, is at best available to you in only limited quantities. There is no doubt that the supply situation for this material is critical. It is not so plentiful as rotenone, another plant insecticide of some interest to you. When you get pyrethrum, use it so it will be effective and only in those places where nothing else can be used as an alternate or substitute. Don't hesitate to let your clients know that you have to use substitutes for it and that they may have to

---

overnight in the laboratory. The results indicate that bean leaves have no attractant action, but they do act as traps by means of the small hooked hairs present on both sides of the leaves. The legs of the insect become entangled in these hooks. The seed pod of the common weed tick trefoil exerts a similar action. Other types of foliage that had no hooked hairs gave negative results.—2-22-42.

Fig. 3.—Bedbugs trapped in hooks on seed pod of tick trefoil. Note cast skins left by bedbug in freeing itself from the hooks.

[2] These hooked hairs on beans have been observed by Poos and Smith (1931) to have an adverse effect on the young nymphs of Empoasca fabae (Harr.). They report that the young nymphs were frequently impaled on the hooks of bean (Stringless Green-pod). They did not observe this action with some other host plants, none of which had hooked hairs.

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choose beween the restrictions necessary to get the job done with "second bests" and the pests. Don't be led astray by statements that a material contains pyrethrum. Remember that pyrethrum is only as good as the pyrethrins it contains. It is the pyrethrins that kill insects, not spent pyrethrum flowers or residues from the flowers.

One of the materials which has been under test by our Bureau is what whispering gossip is referring to as the "new wonder compound." In this, as is usually the case, the whisperings are at best only partly correct. Preliminary work **suggests** it may be very good for some pests, but for others the results secured from tests are little, if any, different from the checks. It is an organic compound and from what has been done with it so far it appears to be like other insecticides of organic origin—specific and restricted in its usefulness. This new material has two long chemical names—2,2-bis-(para-chlorophenyl)-1, 1,1-trichloroethane, or dichloro-diphenyl-trichloroethane. A brief note concerning the material appeared in the October issue of "Pests and Their Control." For brevity it is now generally referred to as DDT, although the active ingredient has also been symbolized by GNB and GNB-A. It is the subject of Swiss, British, and United States patents and the trade names Gesarol and Neocid are associated with it. The United States patent is 2,329,074, entitled "Devitalizing Composition of Matter," issued to Paul Muller under date of September 7, 1943, and assigned to J. R. Geigy A. G., Basle, Switzerland. The material is not now commercially available, nor is its toxic effect on plants and warm-blooded animals, including humans, fully understood. As an insecticide it is still in the experimental stage. In the field of insects attacking and annoying man it has been found to be effective in controlling body lice and is being used for this purpose. In experiments it has given good performance against flies and certain species of roaches. A recent published report by a Swiss investigator records its persistent killing properties when used to control flies. Similar results have been observed by specialists of the Bureau. The tests on roaches suggest that it is not effective against the common **Blattella germanica.** Like all new materials its place in the insecticide field can only be appraised by a lot of research—chemical, entomological, and toxicological.

One of the wartime activities of the Bureau that is keeping many of our people busy is largely of a service nature. Just the identification of the numerous species that attack and annoy man and may transmit disease and those that destroy food and fiber is no small task. Advising and supplying information on insects, insecticides, and means of controlling various species called for review and analysis of data collected through years of research. To meet requests for advice it has also been necessary to explore new fields and in many cases special research has been the only way of supplying the needed answer. This is no place to catalogue this service, but reference to some of the agencies requesting it will show its relation to the war effort. Inquiries from and contacts with military agencies and the Public Health Service on problems in pest control are a part of the daily routine. Inquiries from various units of the War Food Administration and preparing estimates of the amounts of insecticides used for various purposes have called for the assistance of a goodly number of specialists in all the divisions concerned with crop and livestock pests. There are several units of the War Production Board dealing with a wide variety of materials needed to combat pests. All of these units often inquire about a pest, its importance, the need of particular supplies, and the relation their use and the pest have to the main task confronting our Nation.

The Office of Civilian Supplies is one of these and many of the inquiries from them pertain to matters of special interest to your Association.

Much of the foregoing has been what we in the Bureau of Entomology and Plant Quarantine have been doing—independently and with the aid of cooperating entomologists in the states and with industry. What you—the pest control operators—have been doing is for someone else to tell. Your job hasn't been easy—you have been confronted by shortages in labor and supplies. This is something familiar to all. Your job has been tough, but it will be tougher. With it all there is one thing we all need to keep in mind as we do our work and plan for the future. Don't forget that we are all remembered for our mistakes. Important and essential as good work is, mistakes are less easily forgotten. Make all jobs good jobs. State facts, and when substitutes or alternates have to be used advise your clientele. Your business is no different from others—we all have heard of substitutes. Where substitutes or alternates are used be sure you know their limitations. Untried materials should be used with care and in many cases on a small scale first. Some carefully observed small-scale tests may save time, labor, poor results, and a future headache.

For the tomorrow new things will come and the old reliables will be back to make the work easier. Assurance of this prompts the suggestion that it might be well for you to give thought to extending your fields of operation. The field of plant pest control is one which may have many possibilities. Inquiries from urban and suburban plant lovers on how to combat the various pests which attack the trees and ornamentals often include the question: "Whom can I get to do the work? I have no sprayer." There is usually no easy answer. With study, experience, and equipment the pest control operators might provide the answer. That answer might be the same as the one to the question: "Whom can I get to fumigate my house?"

Pests Infesting Parcels Sent From Abroad

Burn that package wrapper, babe, burn that wrapper, babe.

That is the new theme of the United States Department of Agriculture, which points out that such wrappers from the boys over there can carry headaches as well as happiness.

The principal pest uncovered by inspectors, according to the Farm Information Service, State College, N. H., is the pink boll worm. Hundreds have been found in packages examined in various cities throughout the country, many of which were on their way to the Cotton Belt.

Discovery of rice straw and hulls used in packing gifts also is posing a problem, since both are on the quarantine list because of the danger of introducing serious rice insects and diseases.

Because millions of packages are coming in, the short handed customs, postoffice and plant quarantine inspectors are unable to examine all parcels, so, back to the theme song, burn that wrapper, babe, please.

Answers to True and False Questions

1. True
2. True
3. False
4. True
5. True
6. True
7. True
8. True
9. False (not insects)
10. False
11. False
12. False
13. False
14. False
15. True
16. False
17. False
18. False
19. False
20. True
21. True
22. False
23. False
24. False
25. False

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SPECIAL ROACH POWDER

Circular describes a roach powder (containing Lethane A 70) which, it is stated, is fast acting, positive in kill and will not deteriorate for at least eight weeks after application. As a result, the supplier points out, the PCO does not have to service his customers as often, thereby conserving manpower. Moreover, it is stated, the powder is non-toxic to warm blooded animals and may, therefore, be used in dairies, packing and food handling plants, homes, etc., in fact, in all places where sodium fluoride mixtures may not be used. . . . Described also is a sodium fluoride-Pyrane formulation for the PCO who wishes to make his own roach powder.

WRITE PESTS—Bosley.

SODIUM SILICO FLUORIDE

Bulletin describes sodium silico fluoride product with proper density. Effective manner of testing for presence of HCN after ventilation also discussed.

WRITE PESTS—AC 70.

MILITARY FUMIGATION MANUAL

This special 48 page manual has been prepared for the benefit of officers and civilians in the Armed Forces who are responsible for vermin control, and for PCOs who may contract with the Armed Forces for fumigating work. Among other subjects, the manual discusses: dosage, preparation of building for fumigation, fumigation operation, common pests, cockroach control; precautions, first aid methods, etc.

WRITE PESTS—AC.

TERMITE CONTROL

Folder discusses concentrates available for two distinct methods of termite control: (1) treatment of timbers in place with an oil solution, and (2) treatment of all soil around an infested building or area with either an oil or water soluble chemical. Issuing company states it specializes in all problems concerning wood-destroying organisms and also wood preservation and invites your inquiries thereto.

WRITE PESTS—WOOD.

FUMIGATION SAFETY SUGGESTIONS

Of timely interest, in view of the at-hand fumigation season, is this bulletin which advocates as a safety measure the use of methyl orange-mercuric chloride test papers for the presence of HCN. It also discusses can openers for Zyklon Discoids, the need for adequate ventilation after fumigations, and gives a cautionary note on pilot lights in premises to be fumigated.

WRITE PESTS—AMERICAN.

STERILIZING GAS MASKS

News bulletin describes a chemical that is claimed by the manufacturer to be effective in sterilization of gas masks. Bulletin also discusses antidotes and first aid, particularly an inhalant which functions best as an antidote to HCN poisoning, and where obtainable.

WRITE PESTS—A-C-73

FUMIGATION AND PLASTICS

News release discusses use-co-ordination of such diverse chemical products as plastics and fumigants in connection with infested bagged grain, seed, packaged or boxed foodstuffs. Methyl bromide-plastic-tarpaulin method of disinfestation described.

WRITE PESTS—DOW

HOUSEHOLD SPRAY FACTS

Manufacturer's bulletin discusses Lethane's killing power, range of insect control, cost, chemical stability, spray formulas, etc.

WRITE PESTS—ROHM & HAAS.

PYRETHRUM - DERRIS - RED SQUILL PRODUCTS

Leaflet describes foregoing insecticides with special bait chart for use in connection with powdered red squill.

WRITE PESTS—PRENTISS.

SOLVAY PRODUCTS

48-page booklet in colors and illustrated, covering their entire line of Alkalies and Special Products, with a special section dealing with Para-Dichlorobenzene and Ortho-Dichlorobenzene.

FREE COPY MAY BE HAD BY PEST CONTROL OPERATORS. WRITE SOLVAY, c/o PESTS.

DEODORANT

Catalog includes price data, etc., on deodorant which it is felt can neutralize and deodorize such toxic agents as Thanite, Lethane 384 Special, Velsicol, etc. Also contains data on perfume oils for sprays made with pyrethrum and kerosene.

WRITE PESTS—MAGNUS.

FUMIGATION NOTES:

Discusses spread of Discoids; reinfestation; effects on vegetables and eggs.

WRITE PESTS, AC58.

ELECTRIC FANS

Bulletin discusses value of electric fans in connection with fumigation work, also some pertinent thoughts on the Schafer Prone Pressure Method of Resuscitation, etc.

WRITE PESTS—AC-69.

MOLE KILLER PELLETS

Circular describes mole killer pellets which manufacturer states requires no traps, no gas, no exposed poison. Diagram of runways and explains how mole lives. Testimonial letters.

WRITE PESTS—CARAJON.

PRESERVATION OF MILLWORK AND OTHER DRY WOOD PRODUCTS

Bulletin discusses composition of Permatox B Concentrate and its application in the preservation of millwork and other dry wood products.

WRITE PESTS—Permatox 43-B.

INSECT COLLECTIONS

Booklets describes pocket display case which may slip easily into a coat pocket making it of value for salesmen or others who travel about. Life history collections of structural type pests are also available for the PCO.

WRITE PESTS—Ward's.

SAFETY IN FUMIGATION WORK

Fumigation Safety Rule No. 1, namely "Vacate entire building even though only part is fumigated, as well as adjoining buildings into which gas may penetrate" is discussed in this bulletin.

WRITE PESTS—AC No. 78.

PIGEON-PROOFING

Folder describes pigeon-proofing invention which manufacturer claims will completely and decisively eliminate the pigeon nuisance. In use by real estate companies, churches, government buildings, etc.

WRITE PESTS—STANLEY.

CONTROL OF TERMITES-POWDER-POST (LYCTUS) BEETLES-DECAY

Circular discusses properties and uses of Permatox A in termite control and its application to soil and wood to control termites, decay control, powder-post beetle prevention and control. Description of Permatox T and its uses in termite control, as a soil poison, are also discussed, together with toxicity.

WRITE PESTS—BULLETIN 43-T.

BOX CAR FUMIGATION

Folder describes box car fumigation with methyl bromide, giving details as to: car seal, applicator arrangement, methyl bromide application, dosage, exposure period, temperature, aeration, precautions.

WRITE PESTS—DOW

Hydrocyanic Acid Poisoning—Skin Absorption

Bulletin discusses some pertinent safety suggestions with respect to avoidance of hydrocyanic acid poisoning through skin absorption.

WRITE PESTS A-C-74

BIRD REPELLENT

Circular describes product which manufacturer claims will serve as an effective repellent against pigeons, starlings, bats, dogs, cats, rats, mice, woodchucks, moles as well as crawling and flying insects that prey upon plantings and seedlings.

WRITE PESTS—PX

THE ACTIVATING EFFORT OF PYRETHRUM UPON THE GERMAN COCKROACH

Research material prepared by John M. Hutzel, of the Ohio State University, Columbus, Ohio in cooperation with the Kenya Pyrethrum Extension Service, Inc., N. Y. Supervised by Professor F. L. Campbell.

WRITE PESTS—PYRETHRUM.

PRESERVATION OF LUMBER, POLES, POSTS, PLYWOOD WITH PENTA-CHLORPHENOL

This bulletin gives a brief summary of the properties, use to date, and recommendations for the preservative treatment of lumber, poles, posts, and other forest products with Permatox A. This product, it is stated, has shown outstanding promise as an effective and permanent oil preservative for many wood products. Set forth briefly also, are recommendations for the effective preservative treatment of lumber, poles, posts, and other forest products with Permatox A, based upon experience to date.

WRITE PESTS—BULLETIN 43-A.

IMPROVES QUALITY. . . . CUTS COSTS

Thanite for household sprays*

Maximum performance and safety in household sprays can now be achieved at minimum expense—thanks to Thanite*.

A 3% solution of Thanite greatly exceeds the minimum requirements for a commercial AA grade household spray (U. S. Department Commerce Commercial Standard CS 72-38). Not only do sprays made from Thanite have exceptionally fast knockdown and high killing power, but they are effective against a wide range of household insects (flies, mosquitoes, bedbugs, moths, silverfish, ants, and certain other household pests), and . . . when used in normal dilutions . . . are nontoxic to humans.

You'll find authoritative evidence on Thanite in a 20-page Hercules booklet to be available shortly. The edition is limited, so reserve your copy—today.

NON-STAINING . . . Safe to humans, Thanite sprays also will not stain or leave rings on draperies, wallpaper, woodwork, linens, or rugs—or soften protective coatings.

STABLE IN ANY CONTAINER . . . Packaging is simplified, because Thanite sprays are stable in almost any type of container . . . *remain* stable even when carried from season to season.

*Reg. U. S. Pat. Office

NT-43

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MORTICIDE

brings you economy. The initial cost of Morticide is less than that of any standard insecticide concentrate. Our recommended dilution is one part of Morticide with 24 parts of insecticide base oil.

If you want an entirely odorless spray use

SUPER MORTICIDE

The cost is only a fraction more

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